73® Amateur Radio Today

DECEMBER 1999
ISSUE #470
USA $3.95
CANADA $4.95

Secret Death-Ray Antennas *Exposed*

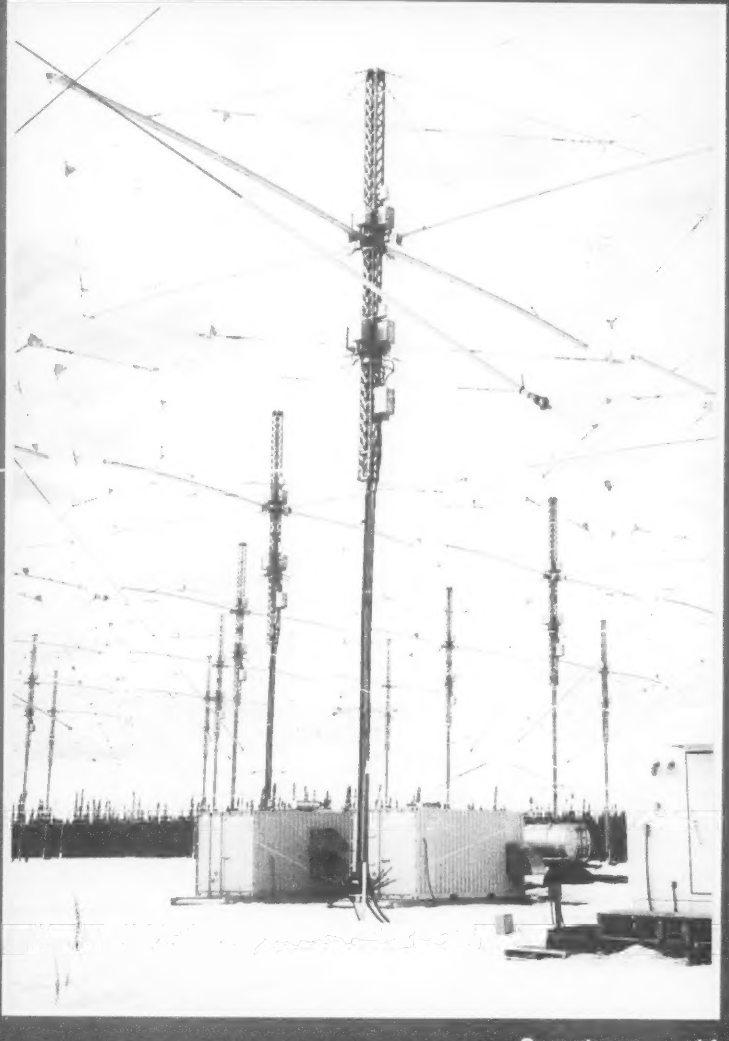
Overkill Bench Supply

Renew On-line — Or Else

The X(mas)-Files

Smarty-Pants Techno-Trivia

More Tuner Mods



Secret — page 14

*******************************5-DIGIT 48103
#00000191940WR5# JUN76 200
SERIALS PROCESSING DEPT 45
UNIV MICROFILMS IT P 1
300 N ZEEB RD
ANN ARBOR MI 48103-1553
12

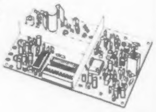
HIGH QUALITY VHF & UHF EXCITER & RECEIVER MODULES

FM EXCITERS:

Rated for continuous duty, 2W continuous duty output.

T301 Synthesized VHF Exciter: for various bands 139-174MHz, 216-226 MHz. Dip switch freq. setting.
- Kit (ham bands only) ...**$109** (TCXO option $40)
- Wired/tested, incl TCXO...**$189**

T304 Synthesized UHF Exciter: various bands 400-470 MHz.



- Kit (440-450 ham band only) incl TCXO ...**$149**
- Wired/tested...**$189**

CRYSTAL CONTROLLED:
- **TA51:** for 6M, 2M, 220 MHz ....**kit $99, w/t $169**
- **TA451:** for 420-475 MHz. ....**kit $99, w/t $169**
- **TA901:** for 902-928 MHz, (0.5W out) ....**w/t $169**

VHF & UHF POWER AMPLIFIERS.

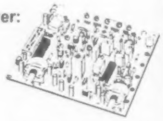
Output levels from 10W to 100W.........**Starting at $99**

FM RECEIVERS:

***Very sensitive** – 0.2μV.*
***Superb selectivity,** >100 dB down at ±12 kHz, best available anywhere, flutter-proof squelch.*

R301 Synthesized VHF Receiver: various bands 139-174MHz, 216-226 MHz.
- **Kit** (ham bands only) ...**only $139** (TCXO option $40)
- **Wired/tested** ...**$209** (includes TCXO)

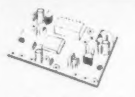
R304 Synthesized UHF Receiver: various bands 400-470MHz.



- Kit (440-450 ham band only) incl TCXO ...**$179**
- Wired/tested...**$209**

CRYSTAL CONTROLLED:
- **R100 RCVR.** For 46-54, 72-76, 140-175, or 216-225 MHz. .... **kit $129, w/t $189**
- **R144 RCVR.** Like R100, for 2M, with helical resonator in front end.......................**kit $159, w/t $219**
- **R451 RCVR,** for 420-475 MHz. Similar to R100 above. ....**kit $129, w/t $189**
- **R901 RCVR,** 902-928MHz ....**kit $159, w/t $219**

SUBAUDIBLE TONE ENCODER/DECODER



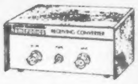
Access all your favorite closed repeaters!

- **Encodes** all standard CTCSS tones with crystal accuracy and convenient DIP switch selection.
- **Decoder** can be used to mute receive audio and is optimized for installation in repeaters to provide closed access. High pass filter gets rid of annoying rcvr buzz.

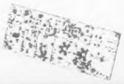
- **TD-5** CTCSS Encoder/Decoder Kit ....now only **$39**
- **TD-5** CTCSS Encoder/Decoder Wired/tested.............**$59**

TRANSMITTING & RECEIVING CONVERTERS

No need to spend thousands on new transceivers for each band!

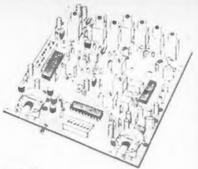


- **Convert vhf and uhf signals to & from 10M.**
- Even if you don't have a 10M rig, you can pick up very good used xmtrs & rcvrs for next to nothing.
- Receiving converters (shown above) available for various segments of 6M, 2M, 220, and 432 MHz.
- Rcvg Conv Kits from $49, wired/tested units only $99.



- **Transmitting converters for 2M, 432 MHz.**
- Kits only $89 vhf or $99 uhf.
- Power amplifiers up to 50W.

R121 AVIATION RECEIVER



NEW

Exciting new AM receiver for the 118-137 MHz aircraft band.
- Ideal for monitoring at small airports.
- Allows pilot control of runway lighting.
- High-quality ELT monitor to detect and locate downed aircraft.
- Dip switch frequency selection.
- Superior sensitivity and selectivity.

R121 Receiver module wired/tested **$209**
R121 Receiver in A87 cabinet **$299**

LOW NOISE RECEIVER PREAMPS

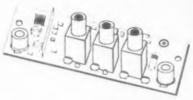
LNY-( ) ECONOMY PREAMP

ONLY $29/w&t

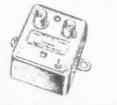
- Miniature MOSFET Preamp.
- Low noise figure.
- *Available* for various bands from 28 to 450 MHz.

LNP-( ) PRESELECTOR

ONLY $39/w&t



- Eliminate intermod!
- Low noise preamp
- Sharp 3-section filter
- Available for bands from 137 to 170 MHz.



LNG-( ) GaAs FET PREAMP

STILL ONLY $59, wired/tested

Available for 28-30, 46-56, 137-152, 152-172, 210-230, 400-470, and 800-960 MHz bands.

WEATHER FAX RECEIVER

Join the fun. Get striking images directly from the weather satellites!

hamtronics R139 WEATHER FAX RECEIVER

A very sensitive wideband fm receiver **optimized for NOAA** APT & Russian Meteor **weather fax** on the 137MHz band.

Covers all 5 satellite channels. Scanner circuit & recorder control allow you to automatically capture signals as satellites pass overhead, even while away from home.

See product review with actual satellite pictures in June 1999 QST, along with info on software and antennas.

- **R139 Receiver Kit** less case **$159**
- **R139 Receiver Kit** with case and AC power adapter **$189**
- **R139 Receiver w/t** in case with AC power adapter ...**$239**
- Internal PC Demodulator Board & Imaging Software **$289**
- Turnstile Antenna **$135**
- Weather Satellite Handbook **$20**

WWV RECEIVER

Get time & frequency checks without buying multiband hf rcvr.

hamtronics RWWV TIME RECEIVER
VOLUME

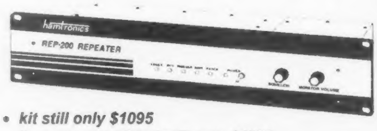
Hear solar activity reports affecting radio propagation. **Very sensitive and selective** crystal controlled superhet, dedicated to listening to WWV on 10 MHz. Performance rivals the most expensive rcvrs.

- **RWWV Rcvr** kit, PCB only **$59**
- **RWWV Rcvr** kit with cabt, spkr, & 12Vdc adapter **$89**
- **RWWV Rcvr** w/t in cabt with spkr & adapter **$129**

Get more features for your dollar with our

REP-200 REPEATER

A microprocessor-controlled repeater with full autopatch and many versatile dtmf remote control features at less than you might pay for a bare bones repeater or controller alone!



- ***kit still only $1095***
- ***factory assembled still only $1295***

50-54, 143-174, 213-233, 420-475 MHz.
☞ **FCC type accepted** for commercial service in 150 & 450 MHz bands.

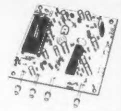
Digital Voice Recorder Option. Allows message up to 20 sec. to be remotely recorded off the air. Play back at user request by DTMF command, or as a periodical voice id, or both. **Great for making club announcements!** ....**only $100**

REP-200C Economy Repeater. Real-voice ID, no dtmf or autopatch. ....**Kit only $795, w&t $1195**

REP-200N Repeater. Without controller so you can use your own. ....**Kit only $695, w&t $995**

You'll KICK Yourself If You Build a Repeater

Without Checking Out Our Catalog First!



Hamtronics has the world's most complete line of modules for making repeaters. In addition to exciters, pa's, and receivers, we offer the following controllers.

COR-3. Inexpensive, flexible COR module with timers, courtesy beep, audio mixer .... **only $49/kit, $79 w/t**

CWID-2. Eprom-controlled ID'er..... **only $54/kit, $79 w/t**

DVR-1. Record your own voice up to 20 sec. For voice id or playing club announcements. ....**$59/kit, $99 w/t**

COR-4. Complete COR and CWID all on one board. ID in eprom. Low power CMOS. .... **only $99/kit, $149 w/t**

COR-6. COR with real-voice id. Low power CMOS, non-volatile memory. .... **kit only $99, w/t only $149**

COR-5. μP controller with autopatch, reverse ap, phone remote control, lots of DTMF control functions, all on one board, as used in REP-200 Repeater. ....**$379 w/t**

AP-3. Repeater autopatch, reverse autopatch, phone line remote control. Use with TD-2. ....**kit $89**

TD-2. Four-digit DTMF decoder/controller. Five latching on-off functions, toll call restrictor. .... **kit $79, w/t $129**

TD-4. DTMF controller as above except one on-off function and no toll call restrictor...........................**w/t $89**

WEATHER ALERT RECEIVER

A sensitive and selective professional grade receiver to monitor critical NOAA weather broadcasts. Good reception even at distances of 70 miles or more with suitable antenna. No comparison with ordinary consumer radios!

hamtronics RWX WEATHER RECEIVER
VOLUME

Automatic mode provides storm watch, alerting you by unmuting receiver and providing an output to trip remote equipment when an alert tone is broadcast. Crystal controlled for accuracy; **all 7 channels** (162.40 to 162.55).

Buy just the receiver pcb module in kit form or buy the kit with an attractive metal cabinet, AC power adapter, and built-in speaker. Also available factory wired and tested.

RWX Rcvr kit, PCB only $79
RWX Rcvr kit with cabinet, speaker, & AC adapter $99
RWX Rcvr wired/tested in cabinet with speaker & adapter $139

Buy at low, factory-direct net prices and save!
For complete info, call or write for complete catalog.
Order by mail, email, or phone (9-12, 1-5 eastern time).
Min. $6 S&H charge for 1st lb. plus add'l weight & insurance.
Use Visa, MC, Discover, check, or UPS C.O.D.

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email: jv@hamtronics.com

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E151765 E151765 LISTED 2F29

...POWER ON WITH ASTRON

SWITCHING POWER SUPPLIES...

SPECIAL FEATURES:

- HIGH EFFICIENCY SWITCHING TECHNOLOGY SPECIFICALLY FILTERED FOR USE WITH COMMUNICATIONS EQUIPMENT, FOR ALL FREQUENCIES INCLUDING HF
- HEAVY DUTY DESIGN
- LOW PROFILE, LIGHT WEIGHT PACKAGE
- EMI FILTER
- MEETS FCC CLASS B

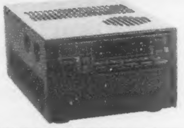
PROTECTION FEATURES:

- CURRENT LIMITING
- OVERVOLTAGE PROTECTION
- FUSE PROTECTION.
- OVER TEMPERATURE SHUTDOWN

SPECIFICATIONS:

INPUT VOLTAGE:	115 VAC 50/60HZ OR 220 VAC 50/60HZ SWITCH SELECTABLE
OUTPUT VOLTAGE:	13.8VDC

AVAILABLE WITH THE FOLLOWING APPROVALS: UL, CUL, CE, TUV.

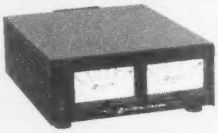

MODEL SS-10TK

MODEL SS-12IF

MODEL SS-18

DESKTOP SWITCHING POWER SUPPLIES

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SS-10	7	10	1⅛ x 6 x 9	3.2
SS-12	10	12	1⅜ x 6 x 9	3.4
SS-18	15	18	1⅞ x 6 x 9	3.6
SS-25	20	25	2⅞ x 7 x 9⅜	4.2
SS-30	25	30	3¾ x 7 x 9⅝	5.0


MODEL SS-25M

DESKTOP SWITCHING POWER SUPPLIES WITH VOLT AND AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SS-25M*	20	25	2⅞ x 7 x 9⅜	4.2
SS-30M*	25	30	3¾ x 7 x 9⅝	5.0

MODEL SRM-30

RACKMOUNT SWITCHING POWER SUPPLIES

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25	20	25	3½ x 19 x 9⅜	6.5
SRM-30	25	30	3½ x 19 x 9⅝	7.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25M	20	25	3½ x 19 x 9⅜	6.5
SRM-30M	25	30	3½ x 19 x 9⅝	7.0

MODEL SRM-30M-2

2 ea SWITCHING POWER SUPPLIES ON ONE RACK PANEL

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25-2	20	25	3½ x 19 x 9⅜	10.5
SRM-30-2	25	30	3½ x 19 x 9⅝	11.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25M-2	20	25	3½ x 19 x 9⅜	10.5
SRM-30M-2	25	30	3½ x 19 x 9⅝	11.0

MODEL SS-12SM/GTX

MODEL SS-10EFJ-98

CUSTOM POWER SUPPLIES FOR RADIOS BELOW	*NEW SWITCHING MODELS*
EF JOHNSON AVENGER GX-MC41	SS-10GX, SS-12GX
EF JOHNSON AVENGER GX-MC42	SS-18GX
EF JOHNSON GT-ML81	SS-12EFJ
EF JOHNSON GT-ML83	SS-18EFJ
EF JOHNSON 9800 SERIES	SS-10-EFJ-98, SS-12-EFJ-98, SS-18-EFJ-98
GE MARC SERIES	SS-12MC
GE MONOGRAM SERIES & MAXON SM-4000 SERIES	SS-10MC, SS-12MG
ICOM IC-F11020 & IC-F2020	SS-101F, SS-121F
KENWOOD TK760, 762, 840, 860, 940, 941	SS-10TK
KENWOOD TK760H, 762H	SS-12TK OR SS-18TK
MOTOROLA LOW POWER SM50, SM120, & GTX	SS-10SM/GTX
MOTOROLA HIGH POWER SM50, SM120, & GTX	SS-10SM/GTX, SS-12SM/GTX, SS-18SM/GTX
MOTOROLA RADIUS & GM 300	SS-10RA
MOTOROLA RADIUS & GM 300	SS-12RA
MOTOROLA RADIUS & GM 300	SS-18RA
UNIDEN SMH1525, SMU4525	SS-10SMU, SS-12SMU, SS-18SMU
VERTEX — FTL-1011, FT-1011, FT-2011, FT-7011	SS-10V, SS-12V, SS-18V

*ICS – Intermittent Communication Service

MFJ *pocket size* Morse Code Tutor

Learn Morse code fast, anywhere . . . LCD display lets you check your copy instantly . . . Easy no-code beginner's course . . . Takes you beyond Extra Class . . . Customized Practice . . .Plain English QSOs . . Word Recognition Mode™ . . . Interactive Mode™ . . . No memorization . . . Never run out of practice!

Learn Morse code anywhere, anytime with this *MFJ Pocket Morse Code Tutor*™!

Take it everywhere! Enjoy code at home, work, on vacation, on a plane or in a hotel -- anywhere!

A large LCD display reads out letters, numbers and punctuation in *plain English*. See code as it is being sent!

MFJ's proven *Beginner's Course* takes you from zero code speed to solid copy fast!

Realistic plain English QSO practice helps you pass your FCC Code exam.

High-speed practice takes you to Extra Class and beyond . . .

Practice copying *entire* words -- not individual characters. Instant word recognition makes you a true, high-speed CW pro.

***InstantReplay*™--** check copy instantly!

MFJ's interactive mode lets *you* set the pace -- *you* decide when to copy the next group and how many -- *not the tutor*.

Easy-to-use -- choose from menus on LCD -- *no instruction manual needed!*

Beginner's Course

QST rate MFJ tutors *"the clear choice for beginners"*. Follows ARRL/VEC format. Learn small fixed sets of characters. Previously learned sets are combined with new sets to reinforce all you have learned.

InstantReplay™

Practice copying, then instantly replay to check your copy on the LCD display.

Custom Character Sets

Having trouble with certain characters? Build and save 3 custom sets of 16 characters for extra practice -- *an MFJ exclusive.*

Realistic Plain English QSOs

Practice copying *realistic* on-the-air style plain English random QSOs. Gets you ready to pass your FCC test and upgrade. Also builds confidence for your first *real* contact.

MFJ Word Recognition Mode™

MFJ's *Word Recognition Mode*™ gives you hundreds of commonly used words in ham radio. Practice recognizing *entire words* instead of individual letters. Learn to copy words without writing it down. Carry on an entire CW QSO without paper -- just like pros on 40 Meter CW. You can also save 10 words of *your choice* for word recognition practice -- *an MFJ exclusive.*

You'll never run out of practice

Select letter, number, punctuation, prosign or FCC character sets (has *only* letters, numbers and prosigns required on FCC tests), random call signs, random words, QSOs or combination sets for practice -- *you'll never run out of study material!* You can even make up and save your own words and character sets for practice.

SET = CUSTOM
MFJ418MORSETUTOR

MFJ-418
$79.95
plus s&h

MFJ InteractiveMode™

***InteractiveMode*™** lets *you* decide when to copy the next or previous group and how many -- great for beginners!

Normal or Farnsworth

Select normal or Farnsworth spacing.

Farnsworth makes it easier to learn *entire* characters. Stop counting individual dots and dashes that slows learning! Farnsworth character speed is adjustable 10 to 60 Words-Per-Minute for high-speed practice.

Fixed or Random Length Groups

Use fixed length or more realistic random length groups (up to 8 characters).

Change speed on the Fly

You can change speed *on-the-fly* while playing a session 3 to 60 words-per-minute.

SettingSaver™

Settings are automatically saved, ready to use next time -- no more #$%@ resets! Turn it on, hit replay. Go back to practice!

No Instruction Manual Needed!

Choose from easy-to-use menus on LCD. Simple 3 button operation.

LARGE LCD Display

Check your copy, select from menus and program custom characters and words on 2 line LCD display with 32 *huge* 1/4 inch high-contrast characters -- *powerful sound and sight learning!*

SilkySmoothSidetone™

Only MFJ gives you *SilkySmooth Sidetone*™ with *TruTone*™ sinewave and *SoftStart*™ dots/dashes -- lets you concentrate on learning without the distraction of harsh keyclicks. Use earphones for private practice or built-in speake for groups. Adjustable volume. Loud powerful audio amplifier. Variable pitch 300-1000 Hz.

True Pocket Size

Fits in your shirt pocket with room to spare - smaller than a pack of cigarettes. Tiny $2^1/_4$x$3^3/_4$x in., weighs less than $5^1/_2$ ounces. Uses 9 volt battery (not included).

Tapes can't compare

Tapes play the same old boring stuff over an over again. Unlike tapes, you'll *never* memorize the MFJ-418 random code sessions. You'll pay more for a few sets of code tapes. The MFJ-418 is less money, more fun and far more effective.

Pocket Tutor Accessories

MFJ-26, $12.95. Soft leather protective pouch for MFJ-418. Clea plastic overlay for display, knob/push button openings, strong pocket/belt clip secures your tutor.

MFJ-281, $12.95. Speaker for group practice Loud, powerful audio! $3^3/_4$x3x$2^1/_4$"

MFJ-291I, $4.95. Comfortable foam earbud earphone for private listening.

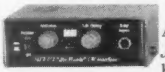
MFJ-3400, $19.95. *Morse Code: Breaking th Barrier*. "How to learn by the Koch Method" boo

More pocket size MFJ Morse Tutors

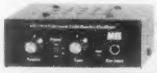
MFJ-417, $59.95. Similar to MFJ-418, but n LCD. Most software features.

MFJ-413, $39.95. Similar to MFJ-417, less random words, QSOs, SettingSaver™.

Other Morse Code Tutor Products



MFJ-552, $79.95. "On-the-Air" CW fun using your HT. *JimHandy*™ plugs into your dua band HT and converts it into a modulated CW transceiver -- just plug in a key!



MFJ-554, $79.95. Classroo Code Practice Oscillator. Clear, sweet sounding CW. Delivers fu 1 watt into built-in speaker.

MFJ-414, $199.95. Deluxe Classroom Morse Code Tutor. Everything in MFJ-418 plus down/upload custom practice from PC, store exam printer port, on-the-air interface, deluxe keyer.

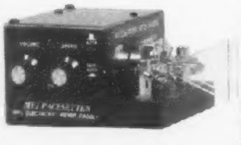
MFJ Code Practice Oscillator

MFJ-557
$29.95

Learn to send Morse code with MFJ-557. Straight key with adjustable travel and tension, and built-in speaker with volume and tone controls lets you practice to your heart's content. Earphone jack. Heavy non-skid steel base stays put as you tap out Morse code. Use 9V battery or 110 VAC with MFJ-1312, $14.95.

MFJ-550, $7.95. Telegraph key only. **Plus s&h.**

MFJ/Bencher Keyer Combo

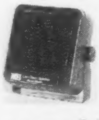


MFJ-422D
$154.95
plus s&h

The best of all CW worlds -- a compact MFJ Keyer that fits right on the Bencher iambic paddle! Iambic keying, speed (8-50 wpm), weight, tone, volume controls. Automatic or semi-automatic/tune mode. RF proof. Fully shielded. Keys all transmitters. 4x$2^1/_4$x$4^1/_4$ inches.

MFJ-422DX, $79.95. Keyer only for mounting on your Bencher or MFJ paddle.

MFJ Communications Speaker



MFJ-281, $12.95. Restores smooth sinewave sound of CW. Makes copying easier! Enhances speech, enhances intelligibility, reduces noise, static, hum.

DXer's 24 Hour Wall Clock

MFJ-125, $29.95. 12 inch diameter DXer's Quartz wall clock gives you 24 hour time. Has three smaller inde pendently settable dials for 12 hour time, day of week and date. No mor day/date confusion when logging DX

Free MFJ Catalog

and Nearest Dealer . . . 800-647-1800

http://www.mfjenterprises.com

• 1 Year *No Matter What*™ warranty • 30 day mone back guarantee (less s/h) on orders direct from MF

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(662) 323-5869; 8-4:30 CST, Mon.-Fri.
FAX: (662) 323-6551; **Add s/h**
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On the cover: HAARP secrets revealed beginning on page 14. We are always looking for interesting articles and cover photos — with or without each other. Your name could be in this space *next* month, and our check could be on its way to *you!* Couldn't you use a little extra cash?

Feedback: Any circuit works better with feedback, so please take the time to report on how much you like, hate, or don't care one way or the other about the articles and columns in this issue. G = great!, O = okay, and U = ugh. The G's and O's will be continued. Enough U's and it's Silent Keysville. Hey, this is *your* communications medium, so don't just sit there scratching your...er...head. FYI: Feedback "number" is usually the page number on which the article or column starts.

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Number 1 on your Feedback card

NEVER SAY DIE

Wayne Green W2NSD/1
w2nsd@aol.com

The Latin Exam

Well, by golly, amateur radio hit the front page of *The Wall Street Journal!* That's the good news. The bad news is that the article made us look like idiots and is unlikely to do anything but turn away even more prospects. The article compared the value of our code exam, for which the League seems willing to kill the hobby in order to preserve, to a Latin exam. It's about as relevant.

Sure, I agree, there are still dozens of old-timers who enjoy the arcane art of CW. We have lots of antique car buffs, too, but that's no reason to make the test for a driver's license include being able to crank a car to start it.

When I first got on the air 60 years ago, around 95% of all ham contacts were via CW. Today it's more like 5%, and definitely time to get out of the 19th century and recognize that the calendar is turning over to the 21st.

If your ARRL director dares to show his face at a club meeting, please do your best to give him a brain enema about this damned code crap and stop the ARRL from making us all look like jerks.

Again, I have nothing against CW, which is just one of the many modes available to us. I just don't like seeing amateur radio being blown away because the ARRL directors want to force us to do what they are convinced is good for us.

In case you haven't noticed, our hobby is dying, and not slowly, either. The monthly FCC figures on new licenses and upgrades are dropping fast.

Ham dealers are going out of business, as are more and more manufacturers. The attendance at Dayton was way down, with empty exhibitor booths everywhere. Ads in *73* are way down, and they're also down in QST, as the industry slowly shrivels away.

The *Journal* reporter was way off base on one point. He said that learning to copy 20 wpm can take years to learn. Well, that's probably right if you use the ARRL system. If you use mine, which takes sneaky advantage of how the brain is wired, you can start from scratch and copy 20 wpm in a few days. Some people do it in a weekend.

This is supposed to be a technical hobby, not a skill hobby, so let's kill the code test requirement before it kills us.

Progress

I'll bet some readers are old enough to remember when the US amateurs were the innovators. The UK, which used to be known as Great Britain, has announced that they're going to lower the code speed requirement for operation on all the HF bands to 5 wpm. Further, they say they expect the next ITU meeting in 2002 or 2003 to do away with the Morse Code requirement entirely, which they will then also do.

Meanwhile the ARRL directors you've elected, and then continued to re-elect, want to continue to maintain the Morse Code barrier for HF operating — thus keeping over half of our licensees from being able to use the HF bands (and perhaps thus guaranteeing that they'll quickly lose interest in the hobby and go away). Talking about very little or less over the local repeater doesn't hold much interest for any but those with low-double-digit IQs.

With an estimated 80% of licensees inactive, there's little incentive to bother renewing their license when it comes up for renewal in ten years. If we make it through Y2K and the other potential disasters predicted for the next few years, unless the ARRL directors wake up we could well be down to 250,000 licensees within ten years. And dropping fast.

Hello, Newington! You're up against the Internet now! And, after many years of almost total obscurity and lack of promotion, few kids today have even heard of amateur radio. Is anybody awake there?

An Education

I see where Bill Gates is now worth $100 billion. Not bad for a kid who read my editorials in *Byte* and *Microcomputing* magazines and dropped out of college to start a little software entrepreneurial business back in 1976. We've been so thoroughly taught to equate an "education" with a college degree that almost everyone believes it. Well, it's a crock.

Richard Sears didn't go to college, and neither did Aaron Montgomery Ward. Nor James Cash Penney Jr., and their stores have done fairly well. John Jacob Astor, who became the richest man in America, left home and started working as a teenager. So did Wall Street financier Jay Gould and steel magnate Andrew Carnegie, oil tycoon John D. Rockefeller, Henry Ford, and David Sarnoff. A recent *Inc.* magazine survey showed that virtually every successful entrepreneur either skipped college or dropped out.

I suspect it was their early start in business that gave them all the edge.

The lesson to be learned from this is that college is for suckers. My own wasted four years in the institution taught me one thing: that almost none of the courses I sweated through have been of the slightest benefit to me in the many businesses I've been in — radio, television, publishing, manufacturing, and retailing in the communications, electronics, computer, and music fields.

Indeed, a college degree is almost invariably a guarantee that a youngster is never going to make a lot of money. Yet, despite all experiences to the contrary, you'll be hard put to find anyone who hasn't been convinced of the enormous value of a college degree. And I'll be surprised if anything I can write will change your deeply embedded belief in college. "There goes Wayne again."

Education *is* important, but it's self-education that counts, not the number of exams you've crammed for in order to get a degree (and then forgotten). When I finally wised up and started my first business, one of the first things I did was take a course in advertising put on by the Advertising Club of New York. I'm quite sure that no college teaches the invaluable things I learned there. And that got me to reading books on advertising because I wanted to learn all I could.

Our child labor and minimum wage laws, which the labor unions have bribed Congress to pass to prevent competition from kids, have done incalculable harm to youngsters.

Yes, of course colleges could be made relevant to the 21st century, but that's going to be over the dead bodies of the college faculties. In my editorials, which I reprinted in my *Declare War* book, and cited again in my *Improving State Government* book ($5, book #30), I explained a simple way college educations could be made relevant.

Continued on page 18

RAMSEY

Cool Wireless Goodies

World's Smallest TV Transmitters

We call them the 'Cubes'.... Perfect video transmission from a transmitter you can hide under a quarter and only as thick as a stack of four pennies - that's a nickel in the picture! Transmits color or B&W with fantastic quality - almost like a direct wired connection to any TV tuned to cable channel 59. Crystal controlled for no frequency drift with performance that equals law enforcement models that cost hundreds more! Basic 20 mW model transmits up to 300' while the high power 100 mW unit goes up to 1/4 mile. Audio units include sound using a sensitive built-in mike that will hear a whisper 15 feet away! Units run on 9 volts and hook-up to most any CCD camera. Any of our cameras have been tested to mate perfectly with our Cubes and work great. Fully assembled - just hook-up power and you're on the air! These are the units that are being built into hats, pagers, cigarette packs and sold for big $$!!

C-2000, Basic Video Transmitter	**$89.95**	**C-3000, Basic Video & Audio Transmitter**	**$149.95**
C-2001, High Power Video Transmitter	**$179.95**	**C-3001, High Power Video & Audio Transmitter**	**$229.95**

Doppler Direction Finder

Track down jammers and hidden transmitters with ease! This is the famous WA2EBY DF'er featured in April 99 QST. Shows direct bearing to transmitter on compass style LED display, easy to hook up to any FM receiver. The transmitter - the object of your DF'ing - need not be FM, it can be AM, FM or CW. Easily connects to receiver's speaker jack and antenna, unit runs on 12 VDC. We even include 4 handy home-brew "mag mount" antennas and cable for quick set up and operation! Whips can be cut and optimized for any frequency from 130-1000 MHz. Track down that jammer, win that fox hunt, zero in on that downed Cessna - this is an easy to build, reliable kit that compares most favorably to commercial units costing upwards of $1000.00! This is a neat kit!!

DDF-1, Doppler Direction Finder Kit	**$149.95**

CCD Video Cameras

Top quality Japanese Class 'A' CCD array, over 440 line line resolution, not the off-spec arrays that are found on many other cameras. Don't be fooled by the cheap CMOS single chip cameras which have 1/2 the resolution, 1/4 the light sensitivity and draw over twice the current! The black & white models are also super IR (Infra-Red) sensitive. Add our invisible to the eye, IR-1 illuminator kit to see in the dark! Color camera has Auto gain, white balance, Back Light Compensation and DSP! Available with Wide-angle (80º) or super slim Pin-hole style lens. Run on 9 VDC, standard 1 volt p-p video. Use our transmitters for wireless transmission to TV set, or add our IB-1 Interface board kit for audio sound pick-up and super easy direct wire hook-up to any Video monitor, VCR or TV with A/V input. Fully assembled, with pre-wired connector.

CCDWA-2, B&W CCD Camera, wide-angle lens	**$69.95**
CCDPH-2, B&W CCD Camera, slim fit pin-hole lens	**$69.95**
CCDCC-1, Color CCD Camera, wide-angle lens	**$129.95**
IR-1, IR Illuminator Kit for B&W cameras	**$24.95**
IB-1, Interface Board Kit	**$14.95**

Mini Radio Receivers

Imagine the fun of tuning into aircraft a hundred miles away, the local police/fire department, ham operators, or how about Radio Moscow or the BBC in London? Now imagine doing this on a little radio you built yourself - in just an evening! These popular little receivers are the nuts for catching all the action on the local ham, aircraft, standard FM broadcast radio, shortwave or WWV National Time Standard radio bands. Pick the receiver of your choice, each easy to build, sensitive receiver has plenty of crystal clear audio to drive any speaker or earphone. Easy one evening assembly, run on 9 volt battery, all have squelch except for shortwave and FM broadcast which has handy SCA output. Add our snazzy matching case and knob set for that smart finished look.

AR-1, Airband 108-136 MHz Kit	**$29.95**
HFRC-1, WWV 10 MHz (crystal controlled) Kit	**$34.95**
FR-1, FM Broadcast Band 88-108 MHz Kit	**$24.95**
FR-6, 6 Meter FM Ham Band Kit	**$34.95**
FR-10, 10 Meter FM Ham Band Kit	**$34.95**
FR-146, 2 Meter FM Ham Band Kit	**$34.95**
FR-220, 220 MHz FM Ham Band Kit	**$34.95**
SR-1, Shortwave 4-11 MHz Band Kit	**$29.95**
Matching Case Set (specify for which kit)	**$14.95**

Touch-Tone Reader

Read touch-tone numbers from any radio, phone line, tape recorder - any audio source! Decipher called numbers on scanners, radio shows, anywhere touch-tones are used. Memory stores up to 256 digits, an 8 digit display window scrolls anywhere in memory. Memory good for 100 years, even with power off! Runs on 7 to 15 volt DC, Available in kit form with optional matching case set or fully assembled in case set. We sell tons of these to private investigators!

TG-1, Tone-Grabber Touch Tone Reader Kit	**$99.95**
CTG, Case for Tone-Grabber Touch Tone Reader	**$14.95**
TG-1WT, Tone-Grabber, fully assembled with case	**$149.95**
AC12-5, 12 Volt DC Wall Plug Adapter	**$9.95**

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For Technical Info, Order Status
Call Factory direct: 716-924-4560

Super Pro FM Stereo Transmitter

Professional synthesized FM Stereo station in easy to use, handsome cabinet. Most radio stations require a whole equipment rack to hold all the features we've packed into the FM-100. Set freq with Up/Down buttons, big LED display. Input low pass filter gives great sound (no more squeals or swishing from cheap CD inputs!) Limiters for max 'punch' in audio - without over mod, LED meters to easily set audio levels, built-in mixer with mike, line level inputs. Churches, drive-ins, schools, colleges find the FM-100 the answer to their transmitting needs, you will too. Great features, great price! Kit includes cabinet, whip antenna, 120 VAC supply. *We also offer a high power export version of the FM-100 that's fully assembled with one watt of RF power, for miles of program coverage. The export version can only be shipped outside the USA, or within the US if accompanied by a signed statement that the unit will be exported.*

FM-100, Pro FM Stereo Transmitter Kit	**$249.95**
FM-100WT, Fully Wired High Power FM-100	**$399.95**

Tiny Transmitters

Gosh, these babies are tiny - that's a quarter in the picture! Choose the unit that's best for you. FM-5 is the smallest tunable FM transmitter in the world, picks up a whisper 10' away and transmits up to 300'. Runs on tiny included watch battery, uses SMT parts. FM-4 is larger, more powerful, runs on 5-12 volts, goes up to a mile. FM4,5 operate in standard FM band 88-108 MHz. FM-6 is crystal controlled in 2 meter ham band, 146.535 MHz, easily picked up on scanner or 2 meter rig, runs on 2 included watch batteries. SMT (surface mount) kits include extra parts in case you sneeze & loose a part!

FM-4MC, High Power FM Transmitter Kit	**$17.95**
FM-5, World's Smallest FM Transmitter Kit	**$19.95**
FM-6, Crystal Controlled 2M FM Transmitter Kit	**$39.95**
FM-6, Fully Wired & Tested 2M FM Transmitter	**$69.95**

AM Radio Transmitter

Operates in standard AM broadcast band. Pro version, AM-25, is synthesized for stable, no-drift frequency and is setable for high power output where regulations allow, typical range of 1-2 miles. Entry-level AM-1 is tunable, runs FCC maximum 100 mw, range 1/4 mile. Both accept line-level inputs from tape decks, CD players or mike mixers, run on 12 volts DC. Pro AM-25 includes AC power adapter, matching case and bottom loaded wire antenna. Entry-level AM-1 has an available matching case and knob set that dresses up the unit. Great sound, easy to build - you can be on the air in an evening!

AM-25, Professional AM Transmitter Kit	**$129.95**
AM-1, Entry level AM Radio Transmitter Kit	**$29.95**
CAM, Matching Case Set for AM-1	**$14.95**

RAMSEY ELECTRONICS, INC.
793 Canning Parkway Victor, NY 14564

See our complete catalog and order on-line with our secure server at:
www.ramseyelectronics.com

FM Stereo Radio Transmitters

No drift, microprocessor synthesized! Excellent audio quality, connect to CD player, tape deck or mike mixer and you're on-the-air. Strapable for high or low power! Runs on 12 VDC or 120 VAC. Kit includes case, whip antenna, 120 VAC power adapter - easy one evening assembly.

FM-25, Synthesized Stereo Transmitter Kit	**$129.95**

Lower cost alternative to our high performance transmitters. Great value, easily tunable, fun to build. Manual goes into great detail about antennas, range and FCC rules. Handy kit for sending music thru house and yard, ideal for school projects too - you'll be amazed at the exceptional audio quality! Runs on 9V battery or 5 to 15 VDC. Add our matching case and whip antenna set for nice 'pro' look.

FM-10A, Tunable FM Stereo Transmitter Kit	**$34.95**
CFM, Matching Case and Antenna Set	**$14.95**
FMAC, 12 Volt DC Wall Plug Adapter	**$9.95**

FM Station Antennas

For maximum performance, a good antenna is needed. Choose our very popular dipole kit or the Comet, a factory made 5/8 wave colinear model with 3.4 dB gain. Both work great with any FM receiver or transmitter.

TM-100, FM Antenna Kit	**$39.95**
FMA-200, Vertical Antenna	**$114.95**

RF Power Booster

Add muscle to your signal, boost power up to 1 watt over a freq range of 100 KHz to over 1000 MHz! Use as a lab amp for signal generators, plus many foreign users employ the LPA-1 to boost the power of their FM transmitters, providing radio service through an entire town. Runs on 12 VDC. For a neat finished look, add the nice matching case set.

LPA-1, Power Booster Amplifier Kit	**$39.95**
CLPA, Matching Case Set for LPA-1 Kit	**$14.95**
LPA-1WT, Fully Wired LPA-1 with Case	**$99.95**

Dinky Radios

Everyone who sees one of these babies says they just gotta have one! Super cute, tiny (that's a Quarter in the picture!) FM radios have automatic scan/search tuning, comfortable ear bud earphones and we even include the battery. The pager style unit looks like a shrunken pager and even has an LCD clock built-in. The crystal clear sound will amaze you! Makes a great gift.

MFMT-1, World's Smallest FM Radio	**$11.95**
PFMR-1, Pager Style LCD Clock & FM Radio	**$12.95**

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ORDERING INFO: Satisfaction Guaranteed. Examine for 10 days, if not pleased, return in original form for refund. Add $6.95 for shipping, handling and insurance. Orders under $20, add $3.00. NY residents add 7% sales tax. Sorry, no CODs. Foreign orders, add 20% for surface mail or use credit card and specify shipping method.

QRX . . .

The X(mas)-Files

57 GREEN ST.
BETHLEHEM PA
11:51 PM DEC 24

We're too late! It's already been here, Mulder. I hope you know what you're doing.

Look, Scully, just like the other homes: Douglas fir, truncated, mounted, transformed into a shrine; halls decked with boughs of holly; stockings hung by the chimney, with care.

You really think someone's been here?

Someone, or something.

Mulder, over here — it's a fruitcake.

Don't touch it! Those things can be lethal.

It's OK. There's a note attached: "Gonna find out who's naughty and nice."

It's judging them, Scully. It's making a list.

Who? What are you talking about?

Ancient mythology tells of an obese humanoid entity who could travel at great speed in a craft powered by antlered servants. Once each year, near the winter solstice, this creature is said to descend from the heavens to reward its followers and punish disbelievers with jagged chunks of anthracite.

But that's legend, Mulder — a story told by parents to frighten children. Surely you don't believe it?

Something was here tonight, Scully. Check out the bite marks on this gingerbread man. Whatever tore through this plate of cookies was massive — and in a hurry.

It left crumbs everywhere. And look, Mulder, this milk glass has been completely drained.

It gorged itself, Scully. It fed without remorse.

But why would they leave it milk and cookies?

Appeasement. Tonight is the Eve, and nothing can stop its wilding.

But if this thing does exist, how did it get in? The doors and windows were locked. There's no sign of forced entry.

Unless I miss my guess, it came through the fireplace.

Wait a minute, Mulder. If you're saying some huge creature landed on the roof and came down this chimney, you're crazy. The flue is barely six inches wide. Nothing could get down there.

But what if it could alter its shape, move in all directions at once?

You mean, like a bowl full of jelly?

Exactly, Scully. I've never told anyone this, but when I was a child my home was visited. I saw the creature. It had long white shanks of fur surrounding its ruddy, misshapen head. Its bloated torso was red and white. I'll never forget the horror. I turned away, and when I looked back, it had somehow taken on the facial features of my father.

Impossible.

I know what I saw. And that night it read my mind. It brought me a Mr. Potato Head, Scully. It knew that I wanted a Mr. Potato Head!

I'm sorry, Mulder, but you're asking me to disregard the laws of physics. You want me to believe in some supernatural being who soars across the skies and brings gifts to good little girls and boys. Listen to what you're saying. Do you understand the repercussions? If this gets out, they'll close the X-Files.

Scully, listen to me: It knows when you're sleeping. It knows when you're awake.

But we have no proof.

Last year, on this exact date, SETI radio telescopes detected bogeys in the airspace over 27 states. The White House ordered a Condition Red. But that was a meteor shower. Officially. Two days ago, eight prized Scandinavian reindeer vanished from the National Zoo in Washington DC. Nobody — not even the zookeeper — was told about it. The government doesn't want people to know about Project Kringle. They fear that if this thing is proved to exist, the public will stop spending half its annual income in a Christmas shopping frenzy. Retail markets will collapse. Scully, they cannot let the world believe this creature lives. There's too much at stake. They'll do whatever it takes to ensure another silent night.

Mulder, I —

Sh-h-h. Do you hear what I hear?

On the roof. It sounds like ... a clatter.

The truth is up there. Let's see what's the matter ...

Found at The Laffatorium [www.laffnow.com] by the Plano Amateur Radio Klub, and published in their December 1998 Parking Ticket.

Bonds

The US Treasury has just announced that it will sell three new types of bonds:

- The Al Gore bond, which has no interest;
- The Monica Lewinsky bond, which has no maturity; and
- The Bill Clinton bond, which has no principal.

It is not true that they will be issuing an ARRL bond, which has no redemption date.

eHAM.net is Here

They call it e ham dot net, and it could be the beginning of a new way for hams to interact with one another and the world around them.

E ham dot net made its debut in cyberspace on September 2nd. Its creator, Bill Fisher W4AN, says that the site can best be described as a community of hams from around the world interacting as a community.

Fisher says that e ham dot net aimed at giving hams a place to share ideas. This is accomplished on many levels, ranging from simple sales ads to propagation and DX information to a chat area where anything can be discussed.

But that's not all. E ham dot net includes news items from *Newsline* and other sources, a callsign server, free ads to swap on-line with listings automatically exported and reposted to the rec dot radio dot swap newsgroup, and much, much more. Access to e ham dot net is free. To take a look go to [www.eHAM.net].

Thanks to W4AN, via Newsline, *Bill Pasternak WA6ITF, editor.*

The Shorter, the Better

If you are planning on putting on a hamfest or convention, think small. At least if you live anywhere in the southeastern United States, that is, where smaller seems to equate with better.

The realization that small hamfests dedicated primarily to flea marketing and ham radio testing are the most popular comes as a result of a survey conducted by the South Eastern Repeater Association. The results, which are available in the fall issue of its *Repeater Journal*, shows that 60% of those surveyed are more likely to attend a one-day hamfest than any other kind of show. 60% also said that all one-day shows should be held only on Saturday with 72% saying that the starting time should be an early 8 a.m. local time. Least popular are full-fledged conventions with manufacturers' representatives and mega displays. Only 39% said that they cared for these types of shows. Also, an overwhelming 64% said that no matter what kind of show it is, they usually head home between 1 and 2 p.m. in the afternoon.

In the area of forums, radio clinics, and other such activities, 54% of those responding said that these are not important to them. Only 33% attend these activities on a regular basis, with another 36% dropping by once in a while. On the other hand, 79% say that having ham radio examinations available at a hamfest or convention is one of the most important services that a show can render. 62% say that exams should be held in the morning.

The SERA survey covers just about every aspect of hamfest activity and contains many revelations that even industry leaders were probably unaware of. It's reasonable to assume that ham radio manufacturers and publishers will be taking a very close look at the facts that the SERA survey delivers as they begin planning their attendance at shows for the year 2000 and beyond.

Thanks to the Repeater Journal, *as reported in* Newsline, *Bill Pasternak WA6ITF, editor.*

Changes at Dayton

Some major changes are coming to the way forum speakers are reimbursed at the Dayton Hamvention. Until now, forum leaders and speakers were given sixty dollars a day for up to two

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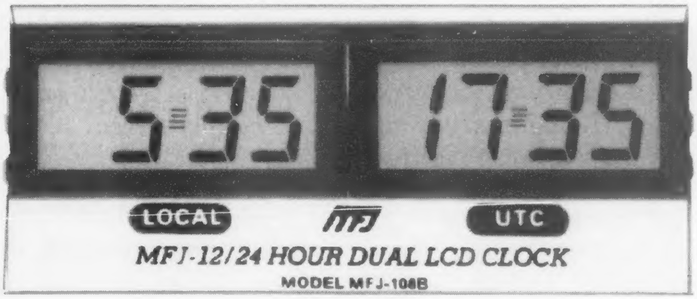
MFJ 24/12 Hour Clocks



Shown actual size

Dual 24/12 hour LCD Clock

MFJ-108B
$19.95
plus s&h

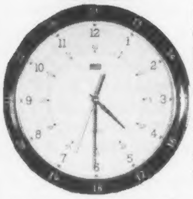
MFJ-108B dual clock has separate 24 hour and 12 hour displays. Lets you read both UTC and local time simultaneously. Features huge high-contrast 5/8 inch LCD numerals that makes it easy to read across the room. Mounted in solid brushed aluminum frame with sloped face for easy viewing. Synchronizable to WWV for split-second timing. Quartz controlled for excellent accuracy. Long life battery included. 4½Wx1D x2H in. MFJ's famous *No Matter What*™ one year limited warranty. *$6 s&h.*

DXer's Wall Clocks

MFJ-125, $29.95. 12 inch DXer's Quartz wall clock gives 24 hour time plus more. Has three smaller independently settable dials for 12 hour time, day of week and date. No more day/date confusion when logging DX! Highly visible, easy-to-read dials! Has Seconds hand.

MFJ-115, $24.95. Set this 24 hour clock to UTC/ GMT and you can determine the time in any time zone of the world at any time of the day. Premier world cities encircle its colorful world map face to indicate time zone. 12 inch face is easy to see across room. Has Seconds hand.

MFJ-105C, $19.95. *World's most popular ham radio wall clock!* True 24 hour Quartz movement. Huge 12 inch black face with large white numerals give excellent visibility across room. Attractive gold colored hour, minute and seconds hands.



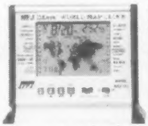
MFJ-126, $24.95. 12 hour Quartz movement gives 12 hour time on inner dial (for XYL) and 1200 to 2400 hour time on its outer dial (for you). Attractive clean, white face is highly visible. Real glass cover! Handsome hunter green trim. Has seconds hand.

Hi-Contrast LCD Clocks

MFJ-119B, $49.95. Giant LCD Display 24/12 Hour Clock. Has *giant* see-across-the-shack 2¼ inch time digits. Digital calendar or clock modes. Displays inside temperature (F/C), relative humidity, month, date and day of week. Handsome hunter green and tan color. Wall mount. 8½x9 inches.

MFJ-118, $24.95. 24/12 hour clock has jumbo 1¼ inch LCD digits. Displays 24 or 12 hour time, year, month, date, and day of week. 100 year full calendar. Hang on wall or desk mount. 5¾Wx2½Hx½D in.

MFJ-107B, $9.95. 24 hour UTC Clock has large 5/8 inch LCD numerals. Synchronizable to WWV. Solid brushed aluminum frame lasts for years. Long life battery included. 2¼x1x2 in.



MFJ-112, $24.95. 24/12 Hour World Map LCD Clock displays time in *every time zone in the world*. Selected time zone flashes on LCD world map. Displays 24 or 12 hours, minutes, seconds, year, month, date, day, time zones, cities. Single button accesses pre-set second time zone. Alarms for two time zones. Adjusts for daylight savings time.

MFJ-152, $24.95. Read Indoor *and* Outdoor temperatures *and* 24/12 Hour time at-a-glance on huge 3/4 inch LCD digits! Choose F or C. Stores minimum and maximum temperature readings. Has backlight for in-the-dark viewing, outdoor temperature sensor with ten foot cable.

Bright LED Clocks

MFJ-114B, $59.95. Bright, GIANT 1.75 inch red LEDs are the biggest and brightest we've ever seen! 24 or 12 hour time with *seconds* digits. Easily seen 50 feet away -- even in the dark! 110 VAC. Great on your desk or mounted on the wall! 12½Wx4½ in.

MFJ-116, $14.95. Big bright 5/8 inch LED digits. 24 or 12 hour, 9 min. ID timer, battery back up. Black. 110VAC. **MFJ-116DC, $19.95.** 12 VDC, plugs in cigarette lighter. *Great for motorhomes and truckers!* 12 hour only.

Monster Display *Atomic Clock* with PinPointAccuracy™

MFJ-120, $69.95. 24/12 hour *Atomic Clock* automatically receives WWVB for millisecond accuracy. Monster 2 inch LCD characters. Reads relative humidity and temperature (F or C). Has alarm. Attractive metallic copper color. Use on desk or mount on wall. Giant 8x10½Wx¾D inch showpiece.

MFJ-388
$29.95

MFJ *CyberEAR*™

Tiny powerful MFJ *CyberEar*™ plugs in and loops over ear -- captures and amplifies sounds by 12 dB! Extends your hearing range, helps you hear every word at hamfests and club talks -- even if you're on the back row! Great for eyeball QSOs. 30 day money back if not absolutely delighted. *Not a hearing aid.*

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Receive continuous weather info/ warnings on all 7 weather channels: 162.4/.425/.45/.475/.5/.525/.55 MHz from 380 U.S. locations 24 hours/day. Also includes AM/FM radio, spotlight, siren, flashing light for emergencies. Water resistant cabinet. Shoulder strap. Great for hamfests, DXpeditions, camping.

14-in-1 *HamTool*™

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Ham Radio's most versatile tool! This 14-in-1 tool pocket-size toolbox is all you need for putting up antennas or working on rigs. Includes needle-nose pliers with wire cutters and jaws for gripping. Has flathead and Phillips screw drivers, knife, ruler, file, punch, more! Stainless steel, belt carrying case.

HamGear™ Waistpak

MFJ-6200
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plus s&h

MFJ's *Ham Gear*™ *WaistPak*™ is the perfect hamfest, DXpedition or field day hands-free carry-all. Has amazing 9 spots to put your ham radio gear, tools, accessories and refreshments. Foam padded and comfortable. Made of heavy duty twill burlap for long life. Features tough webbed belting with solid plastic buckle.

MFJ 1.8-170 MHz SWR Analyzer™

Reads complex impedance . . . Super easy-to-use

New MFJ-259B reads antenna SWR . . . Complex RF Impedance: Resistance(R) and Reactance(X) or Magnitude(Z) and Phase(degrees) . . . Coax cable loss(dB) . . . Coax cable length and Distance to fault . . . Return Loss . . . Reflection Coefficient . . . Inductance . . . Capacitance . . . Battery Voltage. LCD digital readout . . . covers 1.8-170 MHz . . . built-in frequency counter . . . side-by-side meters . . . Ni-Cad charger circuit . . . battery saver . . . low battery warning . . . smooth reduction drive tuning . . . and much more!

The world's most popular SWR analyzer just got incredibly better and gives you more value than ever!

MFJ-259B gives you a complete picture of your antenna's performance. You can read antenna SWR and Complex Impedance from 1.8 to 170 MHz.

You can read Complex Impedance as series resistance and reactance (R+jX) or as magnitude (Z) and phase (degrees).

You can determine velocity factor, coax cable loss in dB, length of coax and distance to a short or open in feet.

You can read SWR, return loss and reflection coefficient at any frequency simultaneously at a single glance.

You can also read inductance in uH and capacitance in pF at RF frequencies.

Large easy-to-read two line LCD screen and side-by-side meters clearly display your information.

It has built-in frequency counter, Ni-Cad charger circuit, battery saver, low battery warning and smooth reduction drive tuning.

Super easy to use! Just set the bandswitch and tune the dial -- just like your transceiver. SWR and Complex Impedance are displayed instantly!

Here's what you can do

Find your antenna's true resonant frequency. Trim dipoles and verticals.

Adjust your Yagi, quad, loop and other antennas, change antenna spacing and height and watch SWR, resistance and reactance change instantly. You'll know exactly what to do by simply watching the display.

Perfectly tune critical HF mobile antennas in seconds for super DX -- without subjecting your transceiver to high SWR.

Measure your antenna's 2:1 SWR bandwidth on one band, or analyze multiband performance over the entire spectrum 1.8-170 MHz!

Check SWR outside the ham bands without violating FCC rules.

Take the guesswork out of building and adjusting matching networks and baluns.

Accurately measure distance to a short or open in a failed coax. Measure length of a roll of coax, coax loss, velocity factor and impedance.

Measure inductance and capacitance. Troubleshoot and measure resonant frequency and approximate Q of traps, stubs, transmission lines, RF chokes, tuned circuits and baluns.

Adjust your antenna tuner for a perfect 1:1 match without creating QRM.

NEW
POWER
97.158 MHz 1.2
R= 39 X= 0 SWR
MFJ HF/VHF SWR ANALYZER
MODEL MFJ-259B
SWR
IMPEDANCE
GATE
MODE
27-70
10-27
70-114
4-10
114-170
1.8-4
TUNE
FREQUENCY MHz

Call your favorite dealer for your best price!

MFJ-259B

$259⁹⁵

And this is only the beginning! The MFJ-259B is a complete ham radio test station including -- frequency counter, RF signal generator, *SWR Analyzer*™, RF Resistance and Reactance Analyzer, Coax Analyzer, Capacitance and Inductance Meter and much more!

Call or write for **Free Manual**

MFJ's comprehensive instruction manual is packed with useful applications -- all explained in simple language you can understand.

Take it anywhere

Fully portable, take it anywhere -- remote sites, up towers, on DX-peditions. It uses 10 AA or Ni-Cad batteries (not included) or 110 VAC with MFJ-1315, $14.95. Its rugged all metal cabinet is a compact 4x2x6¾ inches.

How good is the MFJ-259B?

MFJ *SWR Analyzers*™ work so good, many antenna manufacturers use them in their lab and on the production line -- saving thousands of dollars in instrumentation costs! Used worldwide by professionals everywhere.

More MFJ *SWR Analyzers*™

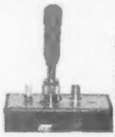
MFJ-249B, $229.95. Like MFJ-259B, but reads SWR, true impedance magnitude and frequency only on LCD. No meters.

MFJ-209, $139.95. Like MFJ-249B but reads SWR only on meter and has no LCD or frequency counter.

MFJ-219B, $99.95. UHF *SWR Analyzer*™ covers 420-450 MHz. Jack for external frequency counter. 7½x2½ x2¼ inches. Use two 9 volt batteries or 110 VAC with MFJ-1312B, $12.95. *Free* "N" to SO-239 adapter.

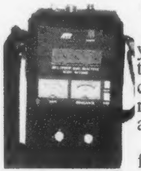
SWR Analyzer Accessories

Dip Meter Adapter



MFJ-66, $19.95. Plug a dip meter coupling coil into your MFJ *SWR Analyzer*™ and turn it into a sensitive and accurate bandswitched dip meter. Save time and take the guesswork out of winding coils and determining resonant frequency of tuned circuits and Q of coils. Set of two coils cover 1.8-170 MHz depending on your *SWR Analyzer*™.

Genuine MFJ Carrying Case



MFJ-29C, $24.95. Tote your MFJ-259B anywhere with this *genuine* MFJ custom carrying case. Has back pocket with security cover for carrying dip coils, adaptors and accessories.

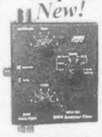
Made of special foam-filled fabric, the MFJ-29C cushions blows, deflects scrapes, and protects knobs, meters and displays from harm.

Wear it around your waist, over your shoulder, or clip it onto the tower while you work -- the fully-adjustable webbed-fabric carrying strap has snap hooks on both ends.

Has clear protective window for frequency display and cutouts for knobs and connectors so you can use your MFJ *SWR Analyzer*™ without taking it out of your case. *Look for the MFJ logo for genuine authenticity!*

MFJ-99, $54.85. Accessory Package for MFJ-259/B/249/B/209. Includes *genuine* MFJ-29C carrying case, MFJ-66 dip meter adapter, MFJ-1315 110 VAC adapter. *Save $5!*

New! *Tunable Measurement Filter*™



MFJ-731, $89.95. *Exclusive* MFJ tunable RF filter allows accurate SWR and impedance measurements 1.8 to 30 MHz in presence of strong RF fields. Has virtually no effect on measurements. Works with all SWR Analyzers.

MFJ *No Matter What*™ warranty

MFJ will repair or replace (at our option) your MFJ *SWR Analyzer*™ for one full year.

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MFJ-224

$159⁹⁵

MFJ 2 Meter *FM SignalAnalyzer*™

Measure signal strength over 60 dB range, check and set FM deviation, measure antenna gain, beamwidth, front-to-back ratio, sidelobes, feedline loss in dB. Plot field strength patterns, position antennas, measure preamp gain, detect feedline faults, track down hidden transmitters, tune transmitters and filters. Plug in scope to analyze modulation wave forms, measure audio distortion, noise and instantaneous peak deviation. Covers 143.5 to 148.5 MHz. Headphone jack, battery check function. Uses 9V battery. 4x2½x6¾ in.

More hams use MFJ SWR Analyzers™ than any others in the world!

hy-gain®

Eight band AV-640 vertical antenna covers 40, 30, 20, 17, 15, 12, 10 and 6 Meters

- **No radials**
- **No traps**
- **No ground**
- **No tuning**
- **Handles 1500 Watts**

hy-gain's new *PATRIOT* HF verticals are the best built, best performing and best priced multiband verticals available today. Make full use of your sunspot cycle with the *PATRIOT's low angle* signal.

The AV-620 covers all bands 6 through 20 Meters with no traps, no coils, no radials yielding an uncompromised signal across all bands.

The AV-640 uses quarter wave stubs on 6, 10, 12 and 17 meters and efficient end loading coil and capacity hats on 15, 20, 30 and 40 meters. Instead of typical lossy can traps, the AV-640 resonators are placed in parallel not in series. End loading of the lower HF bands allows efficient operation with a manageable antenna height.

No ground or radials needed

- **Effective counterpoise replaces radials**
- **End fed with broadband matching unit**

Automatic bandswitching

- **Single coax cable feed**
- **Each band is individually tunable**
- **Wide VSWR bandwidth**

Sleek and low-profile

- **Low wind surface area**
- **Small area required for mounting**
- **Mounts easily on decks, roofs and patios**

Built-to-last

- **High wind survival**
- **Matching unit made from all *Teflon*^R insulated wire**

hy-gain^R warranty

- **One year limited warranty**
- **All replacement parts in stock**

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No other amateur radio company provides the full service customer support that we do every day. Please contact us for more information on *hy-gain*^R Patriot antennas. Not only do we manufacture the best designed and constructed antennas, *we also manufacture satisfied customers.*

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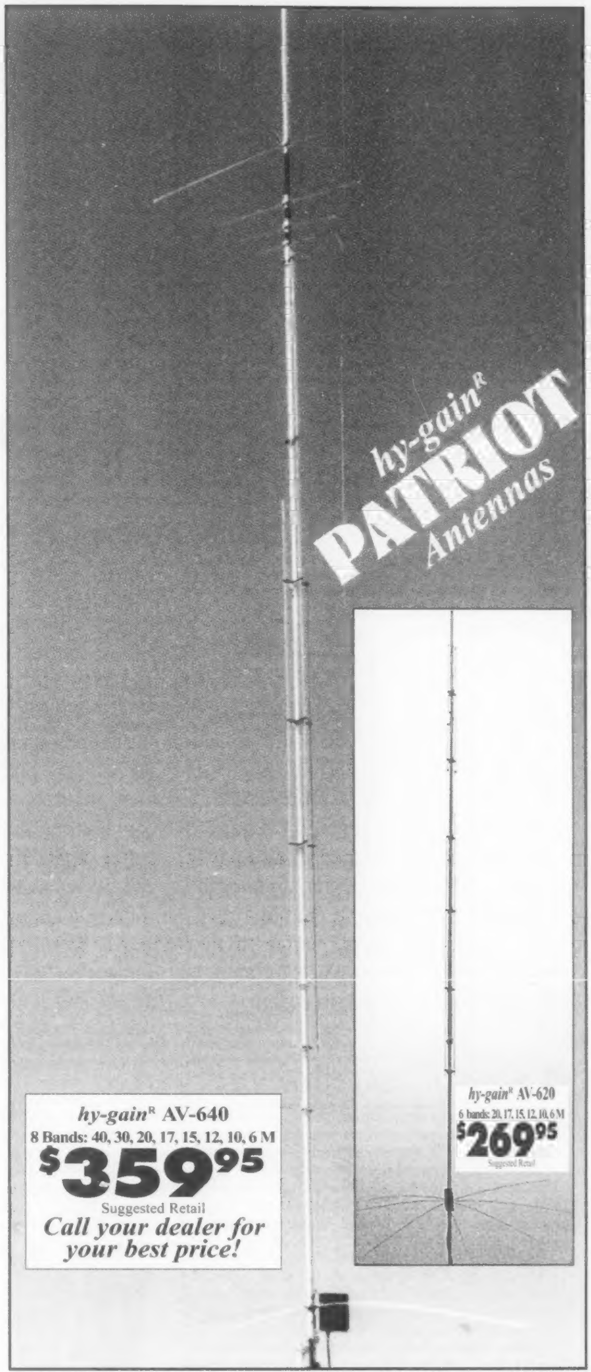
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PATRIOT
Antennas
hy-gain^R AV-640
8 Bands: 40, 30, 20, 17, 15, 12, 10, 6 M
$359^95
Suggested Retail
Call your dealer for your best price!
hy-gain^R AV-620
6 bands: 20, 17, 15, 12, 10, 6 M
$269^95
Suggested Retail

Specifications	AV-620	AV-640
Bands covered (meters)	6,10,12, 15,17,20	6,10,12,15, 17,20,30,40
2:1 VSWR Bandwidth (KHz)		
40M	N/A	150
30M	N/A	175
20M	500	500
17M	500	500
15M	500	500
12M	500	500
10M	1500	1500
6M	2000	1500
VSWR at resonance (typical)	1.5:1	1.5:1
Power handling (watts output) key down 2 minutes	1500	1500
Vertical radiation angle (degrees)	17	17
Horizontal radiation angle (degrees)	360	360
Height (feet)	22.5	25.5
Weight (pounds)	10.5	17.5
Wind surface area (square feet)	2.4	2.5
Wind survival (mph)	80	80

Big-Time Bench Supply

This highly regulated SCR design might be overkill, but it's still fun to build.

Craig Kendrick Sellen
Mallard Meadows RHC
476 Belmont St., Room 405
Waymart PA 18472

Anyone who works with the latest electronic circuits, whether he or she is a professional or an amateur, will eventually require a closely regulated variable voltage power supply. While most power supplies are regulated directly from the basic rectified and filtered DC input, tighter regulation can be obtained by using a preregulated approach in design.

The preregulated power supply described here can be built for just slightly more than you would have to pay for a conventionally regulated low-current power supply. It employs two inexpensive 723 power supply voltage regulator IC chips in a circuit that can deliver from 3 to over 35 volts DC at load currents up to 3 amperes. The design eliminates the need for massive heat sinks and cooling fans.

Circuit description

The preregulated power supply's circuit schematic is illustrated in **Fig. 1**. It can be diagrammed as an AC source, diode bridge rectifier, and two voltage regulators in series. The preregulator, by means of silicon-controlled rectifier

Continued on page 12

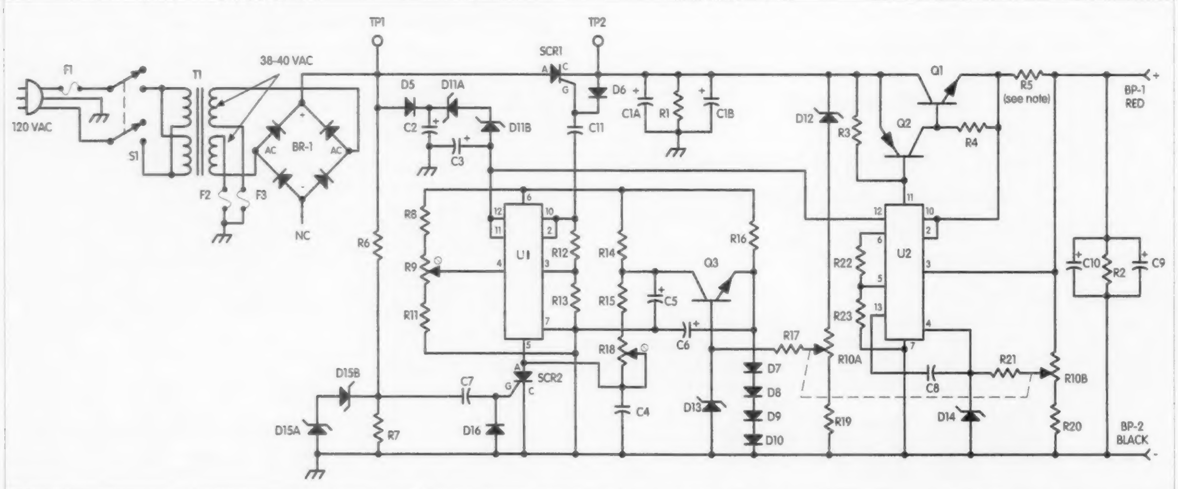
TP1
TP2
F1
120 VAC
S1
T1
38-40 VAC
BR-1
AC
AC
+
-
F2
F3
NC
SCR1
A
C
G
D5
D11A
C2
C3
D11B
C11
D6
C1A
R1
C1B
R6
R8
R9
R11
U1
R12
R13
R14
R15
R16
R18
Q3
C5
C6
C4
SCR2
C7
D15B
D15A
R7
D16
D7
D8
D9
D10
D13
R17
R10A
R19
D12
R3
Q1
Q2
R4
R5
(see note)
BP-1
RED
U2
R22
R23
C8
R21
R10B
D14
R20
C10
R2
C9
BP-2
BLACK
+
-

Fig. 1. Circuit schematic. Notes: 1. Mount SCR1 and Q1 on 4 x 2-1/2 x 1-inch heat sink. 2. R5 current limit: 3A — 5W/0.2Ω; 2A — 3W/0.3Ω; 1.5A — 2W/0.4Ω; 1A — 1W/0.6Ω; 0.75A — 1W/0.8Ω; 0.5A — 0.5W/1.2Ω; 0.25A — 0.5W/2.2Ω. 3. A 120 VAC neon panel lamp with built-in resistor can be mounted across the two poles of S1, such that it is on when the switch is thrown. 4. Along the connection between pin 12 of U1 and pin 12 of U2, voltage must not exceed 39 V.

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Mfg. suggested list price $515.00/**Special $299.95**

Looking for a great hand-held two-way transceiver? Amateur radio operators depend on the RELM MPV32 transceiver for direct two-way communications with their ham radio repeater, fire, police department or civil defense agency. The MPV32 is our most popular programmable frequency agile five watt, 32 channel hand-held transceiver that has built-in CTCSS. This feature may be programmed for any 39 standard EIA tones. Frequency range 136.000 to 174.000 MHz. The full function, DTMF compatible keypad also allows for DTMF Encode/Decode and programmable ANI. Weighing only 15.5 oz., it features programmable synthesized frequencies either simplex or half duplex in 2.5 KHz. increments. Other features include PC programming and cloning capabilities, scan list, priority channel, selectable scan delay, selectable 5 watt/1 watt power levels, liquid crystal display, time-out timer and much more. When you order the MPV32 from CEI, you'll get a complete package deal including antenna, 700 ma battery (add $20.00 to substitute a 1000 ma battery), battery charger, belt clip and user operating instructions. Other useful accessories are available. A heavy duty leather carrying case with swivel belt loop part **#LCMP** is $49.95; rapid charge battery charger, part **#BCMP** is $69.95; speaker/microphone, part **#SMMP** is $54.95; extra high capacity 1000 ma. ni-cad battery pack, part **#BPMP1** is $79.95; extra 700 ma. ni-cad battery pack, part **#BPMP7** is $59.95; cloning cable part **#CCMP** is $34.95; PC programming kit, part **#PCKIT030** is $224.95. A UHF version with a frequency range of 450-480 MHz. part **#MPU32** is on special for $299.95. Your RELM radio transceiver is ideal for many different applications since it can be programmed with just a screwdriver and programming instructions in less than 10 minutes. Programming is even faster with the optional PC kit. The programming instructions part **#PIMPV** is $19.00. Call 1-800-USA-SCAN to order.

Bearcat®895XLT-A1 Radio Scanner

Mfg. suggested list price $729.95/**Special $194.95**
300 Channels • 10 banks • Built-in CTCSS • S Meter
Size: 10-1/2" Wide x 7-1/2" Deep x 3-3/8" High
Frequency Coverage: 29.000-54.000 MHz., 108.000-174 MHz., 216.000-512.000 MHz., 806.000-823.995 MHz., 849.0125–868.995 MHz., 894.0125-956.000 MHz.

The Bearcat 895XLT is superb for intercepting trunked communications transmissions with features like TurboScan™ to search VHF channels at 100 steps per second. This base and mobile scanner is also ideal for intelligence professionals because it has a Signal Strength Meter, RS232C Port to allow computer-control of your scanner via optional hardware and 30 trunking channel indicator annunciators to show you real-time trunking activity for an entire trunking system. Other features include ***Auto Store*** – Automatically stores all active frequencies within the specified bank(s). ***Auto Recording*** – Lets you record channel activity from the scanner onto a tape recorder. ***CTCSS Tone Board*** (Continuous Tone Control **S**quelch System) allows the squelch to be broken during scanning only when a correct CTCSS tone is received. For maximum scanning enjoyment, order the following optional accessories: **PS001** Cigarette lighter power cord for temporary operation from your vehicle's cigarette lighter $14.95; **PS002** DC power cord - enables permanent operation from your vehicle's fuse box $14.95; **MB001** Mobile mounting bracket $14.95; **EX711** External speaker with mounting bracket & 10 feet of cable with plug attached $19.95. The BC895XLT comes with AC adapter, telescopic antenna, owner's manual and one year limited Uniden warranty. Not compatible with AGEIS, ASTRO, EDACS, ESAS or LTR systems.

TrunkTracking Radio

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SAVE $70 on one **BC245XLT**

Save $70 when you purchase your Bearcat 245XLT scanner directly from Communications Electronics Inc. For fast delivery, enter your order through our web site http://www.usascan.com or call Communications Electronics at 1-800-USA-SCAN. TERMS: Good only in USA & Canada. Only one coupon is redeemable per purchase. Void where prohibited.

Bearcat® 245XLT-A TrunkTracker

Mfg. suggested list price $429.95/**CEI price $269.95**
300 Channels • 10 banks • Trunk Scan and Scan Lists
Trunk Lockout • Trunk Delay • Cloning Capability
10 Priority Channels • Programmed Service Search
Size: 2-1/2" Wide x 1-3/4" Deep x 6" High
Frequency Coverage:
29.000-54,000 MHz., 108-174 MHz., 406-512 MHz., 806-823.995 MHz., 849.0125–868.995 MHz., 894.0125-956.000 MHz.

Our new Bearcat TrunkTracker BC245XLT, is the world's first scanner designed to track Motorola Type I, Type II, Hybrid, SMARTNET, PRIVACY PLUS and EDACS®analog trunking systems on any band. Now, follow UHF High Band, UHF 800/900 MHz trunked public safety and public service systems just as if conventional two-way communications were used. Our scanner offers many new benefits such as **Multi-Track** – Track more than one trunking system at a time and scan conventional and trunked systems at the same time. **300 Channels** – Program one frequency into each channel. **12 Bands, 10 Banks** – Includes 12 bands, with Aircraft and 800 MHz. 10 banks with 30 channels each are useful for storing similar frequencies to maintain faster scanning cycles or for storing all the frequencies of a trunked system. **Smart Scanner** – Automatically program your BC245XLT with all the frequencies and trunking talk groups for your local area by accessing the Bearcat national database with your PC. If you do not have a PC simply use an external modem. **Turbo Search** – Increases the search speed to 300 steps per second when monitoring frequency bands with 5 KHz. steps. **10 Priority Channels** – You can assign one priority channel in each bank. Assigning a priority channel allows you to keep track of activity on your most important channels while monitoring other channels for transmissions. **Preprogrammed Service (SVC) Search** – Allows you to toggle through preprogrammed police, fire/emergency, railroad, aircraft, marine, and weather frequencies. **Unique Data Skip** – Allows your scanner to skip unwanted data transmissions and reduces unwanted birdies. **Memory Backup** – If the battery completely discharges or if power is disconnected, the frequencies programmed in your scanner are retained in memory. **Manual Channel Access** – Go directly to any channel. **LCD Back Light** – An LCD light remains on for 15 seconds when the back light key is pressed. **Autolight** – Automatically turns the backlight on when your scanner stops on a transmission. **Battery Save** – In manual mode, the BC245XLT automatically reduces its power requirements to extend the battery's charge. **Attenuator** – Reduces the signal strength to help prevent signal overload. The BC245XLT also works as a conventional scanner. Now it's easy to continuously monitor many radio conversations even though the message is switching frequencies. The BC245XLT comes with AC adapter, one rechargeable long life ni-cad battery pack, belt clip, flexible rubber antenna, earphone, RS232C cable, Trunk Tracker frequency guide, owner's manual and one year limited Uniden warranty. Not compatible with AGEIS, ASTRO, ESAS or LTR systems. Hear more action on your radio scanner today. Order on-line at http://www.usascan.com for quick delivery.

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Bearcat BCT7-A information mobile scanner	$149.95
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ICOM PCR1000-A1 computer communications scanner	$399.95
ICOM R10-A1 handheld wideband communications rec.	$339.95

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Big-Time Bench Supply

continued from page 10

SCR1, continuously controls the voltage at C1, so that the voltage across Q1 remains at a constant level. The output regulator U2 is a high-performance circuit that is capable of supplying 0.1 percent regulation.

Synchronized to the 120 Hz rectified AC input, preregulator U1 is designed as a time-delayed pulse generator that controls the gate of SCR1, which triggers conduction at the exact point in time required during each half cycle. The bias potential applied to the inverting (pin 4) input of U1 is controllable by trimpot R9. This potentiometer determines the fixed reference level for the supply.

The zener-regulated source at pin 6 of U1 also supplies current through R14, R15, R18, and C4 at pin 5 of U1 (non-inverting input). The current continues to flow until the reference potential is exceeded. At this time, U1 conducts. The resulting square-wave pulse from pin 10 of the integrated circuit is limited to 9 volts by current-sensing resistors R12 and R13, and is sufficient to trigger the gate of SCR1 into conduction.

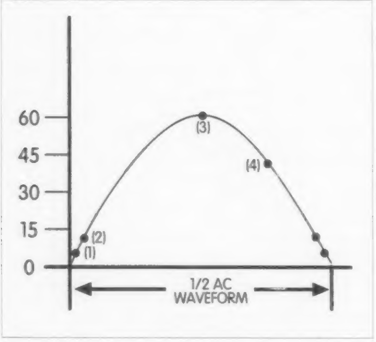

Fig. 2. *Y-axis shows SCR anode voltage. SCR event sequence: 1. SCR2 triggers as C7 charges; C4 then discharges and U1 cuts out. 2. D15 limits potential on C7; then SCR2 cuts out and C4 begins to charge. 3. Capacitor C4 has charged above reference level at pin 4 of U1, causing the IC to conduct; a trigger pulse at pin 10 turns on SCR1 through capacitor C11. 4. SCR1 current decreases as capacitor C1 potential increases; when the potential across SCR1 is insufficient to maintain approximately 10 mA, the current through SCR1 cuts out. Note: SCR1 conducts on and off at approximately #3 and #4 on the curve when the output load is drawing 3 amperes at 35 volts. With no external load, events #3 and #4 occur near the end of the waveform, as indicated by the unmarked dots on the curve.*

The RC time constants in the circuit are controlled by the amount of current flowing through transistor Q3, which in turn depends on the voltage error present at the R10A wiper. Resistor R16 and diodes D7 through D10 make up a voltage divider that applies a constant 2.4 volts to the emitter of transistor Q3, so that when the base of Q3 goes above 3 volts, that will present a voltage drop across resistor R14 and a corresponding change in the RC time constant. C5 and C6 provide stability for the proper operation of Q3 to prevent SCR1 from triggering erratically. When the wiper of R10 is rotated CCW, R17 and D13 prevent damage to Q3 and D12.

The method of synchronizing U1 to the rectified supply input is illustrated graphically in **Fig. 2**. Triggered into conduction by the positive-going voltage waveform, SCR1 cuts out when the gate voltage stops and capacitor C4 discharges sufficiently to reduce to a minimum the holding current to the SCR. The diagram also reveals why the secondary voltage from T1 must be greater than would be normal in a conventionally regulated power supply. The SCR cannot conduct until its anode is more positive than its cathode. Simultaneously, a minimum latching current must flow as well. Also, SCR1 must remain conducting until the energy drawn from capacitor C1 by the output load is replenished.

Since the voltage across capacitor C1 will be about 40 volts at maximum output load, the 18-volt difference allows the time interval necessary for maximum current. This also means that SCR1 triggers only near the peak of the waveform or on the negative-going side of the waveform. The minimum holding current required by SCR1 is supplied by bleeder resistors R1 and R2.

The dual potentiometer R10A and R10B establishes feedback to both IC voltage regulators. R10A and R10B should be evenly matched, so a wirewound potentiometer is used between the two regulator sections. This is done so an identical voltage is always present across each section of the pot. The wiper voltages should be very nearly the same at any setting. The potentiometer R10B section samples the output voltage and directs U2 in the proper direction to maintain 3 volts between the wiper and ground. The R10A section samples the voltage across capacitor C1, controls the triggering of SCR1, and also maintains 3 volts between the wiper and ground.

Since the voltage at the CCW ends of R10A and R10B have to be the same, the voltage across capacitor C1 will be 6 volts higher than the output because of the effect of D12. Any change in the output voltage and/or current will affect the triggering-pulse timing at the gate of SCR1, maintaining a constant voltage across transistor Q1.

Testing and alignment

To compensate for component tolerances, U1 has to be initially aligned. To accomplish this task, you will need the use of an oscilloscope, high impedance DMM, and an improvised load on the output. Rotate R10 CCW, and set trimpot R18 to maximum resistance and trimpot R9 for maximum voltage gain at U1 (pin 4) before turning the power supply on. Connect the oscilloscope between TP1 and ground. Also connect a DMM between TP2 and ground. Then apply power to the supply. Now a small voltage should appear at TP2, but the oscilloscope should show that SCR1 is not conducting. Keeping the voltage reference level as high as possible at pin 4 of U1, adjust R18 and R9 until SCR1 triggers at a regular rate and the DMM shows 9 volts at TP2. When R10 is rotated completely clockwise, the DMM should show 40 volts at TP2. Place a jumper wire across R5, temporarily shorting it out, and then momentarily place a 12 ohm 150 watt power resistor or some other parallel combination equivalent across the supply output connected to BP1 and BP2. If the TP2 reading on the DMM decreases more than 0.2 volt, or if SCR1 triggers intermittently, then adjust R9 only enough to correct it. Then, with the load resistor (12 ohm) removed from the output, rotate R10 CCW. The DMM reading at TP2 should slowly decrease to 9 volts. If it does not, adjust trimpot R9 for a higher voltage at pin 4 of U1 until it does.

Rotate R10 once again and apply the load, compensating for the voltage decrease by adjusting trimpot R18. There will be some combination of the two adjustments that will allow transistor Q3 to hold control over U1 throughout the specified current and voltage ranges. To achieve this, transistor Q3 must always be forward biased; if at any time Q3 does not draw the proper current through R14, it has lost control.

Correct alignment will be accomplished when the voltages at the wipers of R10A and B are the same at any output setting. To test this further, connect the DMM across transistor Q1 and note the voltage change when R10 is rotated clockwise. Any difference should correspond with zener diode D12's voltage characteristics at bias currents between 1 and 7 mA. 73

Parts List			
Semiconductors			
U1, U2	LM723 voltage regulator IC, RS #276-1740	**D11**	Two 10 V 1 W zener diodes in series (1N4740A)
Q1	2N3055 NPN transistor	**D12–D14**	6 V 1 W zener diode (1N1509) or (1N5233B)
Q2	2N4919 PNP transistor #526-NTE 185	**D15**	Two 3.9 V 400 mW zener diodes in series (1N4730A)
Q3	2N2222 NPN transistor	**BR1**	100 PIV 5 A bridge rectifier
D5	100 PIV 1 A silicon rectifier diode 1N4002	**SCR1**	#526-NTE 5463
D6, D7–D10, D16	1N914 or 1N4148 general purpose silicon diode	**SCR2**	#526-NTE 5400
Resistors — All resistors are 1/2 W 5% unless otherwise noted			
R1, R2	1000 Ω 5 W 10% wirewound	**R12**	120 Ω
R3, R21	680 Ω	**R13**	1800 Ω
R4	Two 12 Ω 1/2 W in parallel	**R14**	3300 Ω
R5	0.2 Ω 5 W wirewound	**R15**	Two 150 kΩ resistors in parallel
R6	4700 Ω 1 W	**R17**	1500 Ω
R7, R16	4700 Ω	**R18**	50 kΩ 10T miniature PC trimpot
R8, R11	3900 Ω	**R19, R20**	470 Ω
R9	5000 Ω 10T miniature PC trimpot	**R22**	4300 Ω 1%
R10	5000 Ω dual wirewound potentiometer	**R23**	3200 1%
Capacitors			
C1A, C1B	Dual 5000 µF 75 WVDC electrolytic can	**C7, C8**	0.001 µF ceramic disc
C2, C3	100 µF 75 WVDC electrolytic	**C9**	1000 µF 50 WVDC electrolytic
C4	0.05 µF ceramic disc	**C10**	1 µF 50 WVDC tantalum electrolytic
C5	100 µF 16 WVDC electrolytic	**C11**	0.01 µF ceramic disc
C6	33 µF 16 WVDC electrolytic		
Other Components			
T1	120 VAC dual primary, 38–40 VAC dual secondary at 3 A transformer	**S1**	DPST switch (power)
F1	2 A slo-blo fuse with panel mount holder	**BP1, BP2**	5-way binding posts (1 red, 1 black)
F2, F3	3 A slo-blo fuse with PCB clips	**TP1, TP2**	Panel-mount test points

Table 1. Parts list.

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Secret Death Ray

Or is HAARP a useful science tool?

Donald Koehler N7MGT
4819 E. 6th Ave.
Anchorage AK 99508-2317

The title of this article sounds scary, but a quick search on the Internet will reveal sites with headlines about the High-frequency Active Auroral Research Project — or HAARP — that are almost as scary. To this long-time electronics technician with extensive RF experience, some of the initial reporting about the system seemed, well, just a bit sensational. In the past, this and other magazines have featured articles on the system and site that all had a common thread: The author had never been to the site in question.

Even the Alaskan author of the infamous book *Angels Don't ...* has never been to the site. So, my wife and I did something most writers about the HAARP system have failed to do — we drove up to the site and looked things over.

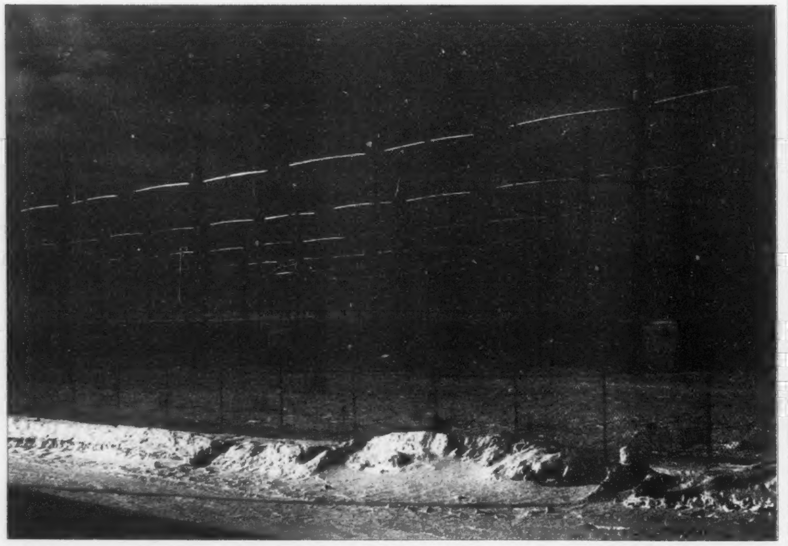

Photo A. Classic view of the HAARP antenna field. Transmitters are housed in the large white vans.

The government liaison to the site is a ham himself, and we set up a time when we would both be open to visit. He has helped to get several listening tests produced — more on this later. The HAARP site is located just over 150 miles north of Anchorage. It was a very pleasant three-hour drive on a cold, sunny day in the winter of '98 to get to the site for a visit. We had arranged to be on site just before the start of the first listening test.

The site was easy to find due to the large — and empty — generator building found on site. The location had originally hosted a "Relocatable Over the Horizon" radar system for the US Air Force, but now it is used by scientists to study the upper atmosphere.

Given that the system has been granted almost cult status as, among other things, an ultra-top-secret CIA-operated mind control device, we were surprised to find no discernible physical security. For example, the gate to the site was open and deeply buried in snow, so even to close it would have

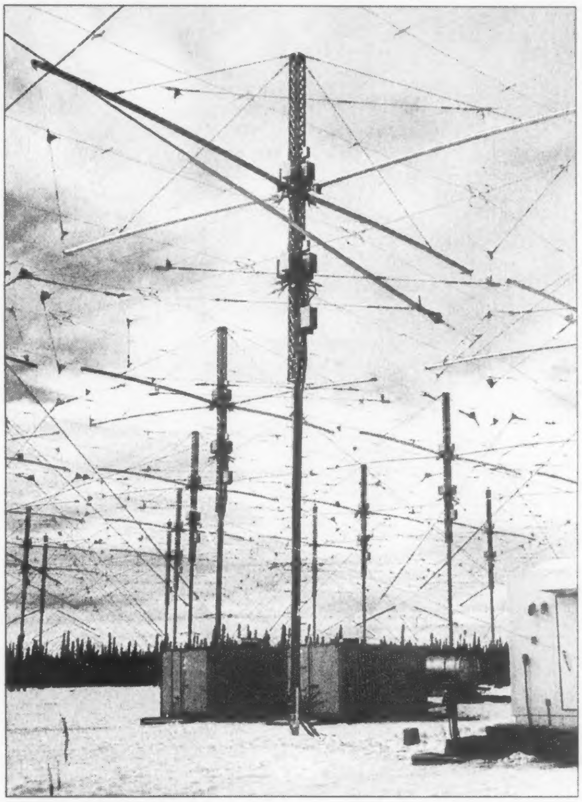

Photo B. Close-up view of the antenna field. Note the ground counterpoise for the antennas to "steer against."

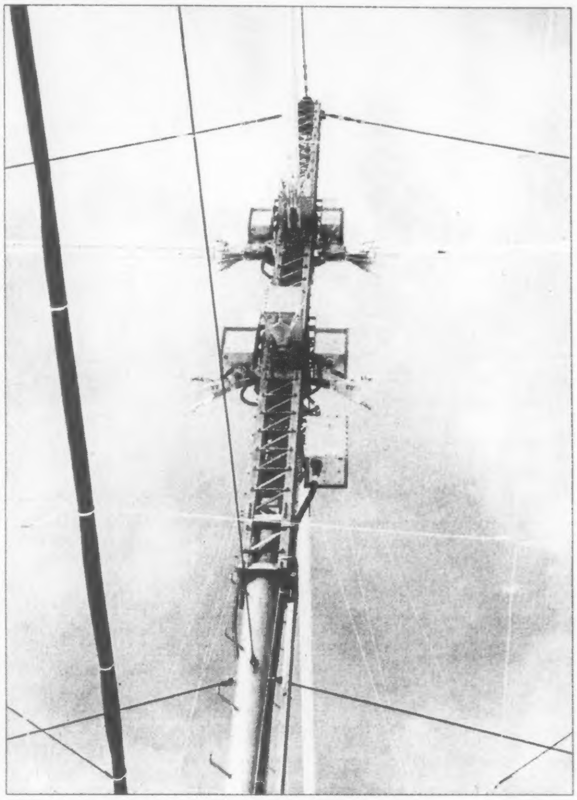

Photo C. Detail of the phasing elements on the antenna towers; the antennas and their feed are phased for directional control.

required a lot of digging. Little matter, as the snow was over the top of the fence and you could walk in anytime, anyway.

As we drove farther into the site, we found a couple of small buildings and a cluster of older mobile homes. After a quick look around, we found a small "Entrance" sign by a door and made our entrance. The door was unlocked, by the way. We wandered around for several minutes calling loudly — and finally made contact with Ed, the ham (and government agent) we had talked to in setting up the visit.

He gave us a complete tour of the site, opened every door we asked him to, and allowed us to photograph anything we desired. I worked in classified areas while in the military, and I can tell you that this HAARP site had nothing that could even remotely be considered classified. So much for the "mind control/doomsday box" myth.

What we did see was straightforward, high-power HF transmitters and

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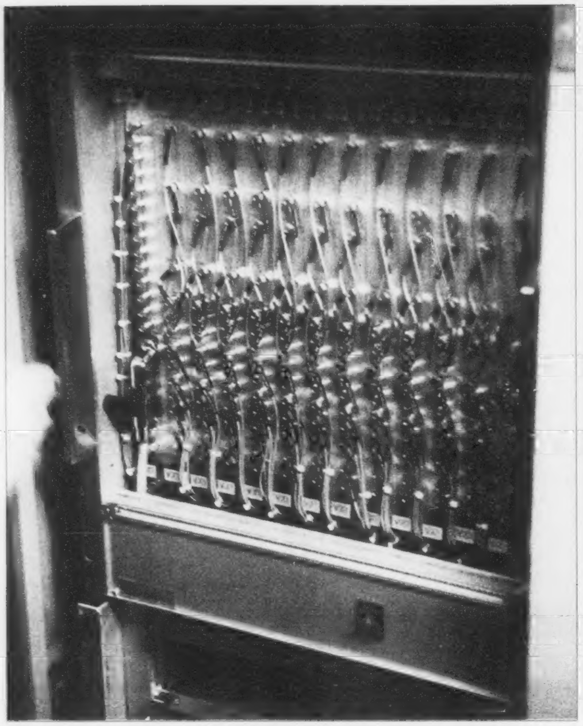

Photo D. A control panel; this unit controls the phase of the feed to the antenna set.

Photo E. Mary examines power pentode and finds no markings in Klingon — just Varian.

the electronically steerable antennas — the same view, by the way, that you can find on the HAARP Web site.

My wife Mary has an abundance of common sense. While not technically oriented, she can smell a rat a mile away. She gave these guys a clean bill of health. I have a 30-year background in electronics and a B. Sci. degree, and have spent a lot of years working on very high-end military electronics. What I saw here was a site devoted to science, funded in part by the Navy.

The site does contain several instruments of value to hams. These are the current recording riometer and a "waterfall"-type spectrum analyzer, both of which will allow you to keep track of the ionosphere from the Internet. It also has a running "snapshot" of the received signal levels for WWV on 15 MHz and 20 MHz, as well as the 49 meter SW broadcast band. All very useful. Find these at [nrl.navy.mil/projects/haarp/index.htmlhttp://w3] and, specifically, you can find more information on the ionosphere at [http://w3.nrl.navy.mil/projects/haarp/ionindex.html]. For fun, they have a Webcam on site. You can see the current daytime weather in interior Alaska.

The site has a variety of other sophisticated RF test equipment — all of which can be accessed via the World Wide Web. The settings of the equipment are controlled via a computer bus, but the readings are available for your use. In addition to the RF test equipment, a recording magnetometer is on-site to track geomagnetic disturbances that may impact the ionosphere, which has a direct affect on propagation. While not a complete tool for hams in the CONUS, it is a solid

Photo F. Off-the-shelf PCs are used to control the system and test equipment.

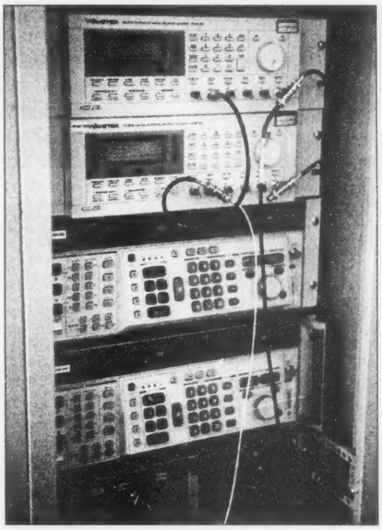

Photo G. Some of the HP test equipment used on site to monitor the signal produced by HAARP.

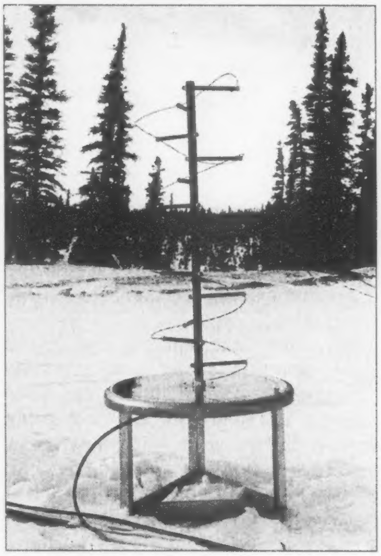

***Photo I.** Another antenna used in the science package found on-site.*

place to gather data to compare to other information sources focused on the CONUS.

What impact does the site have on propagation? The site has sponsored several listening tests for hams — with spotty results. Hams in Alaska have been able to hear the site, and hams outside of Alaska seem to have had limited luck in bagging it. Even when the site is in operation — for a campaign — I have noticed no effect to received signals here at my station. There is a greater impact to my station operations from auroral flutter than anything the HAARP site has produced to date.

Once and if the site gets the funding to increase their power, I may have to revise this observation. The HAARP folks publish their transmission schedule in advance, so you can check with their Web page to discover their transmit times and monitor on your own — before, during and after the test. An HF beacon station or WWV would be best to listen to — I can't tell any difference, but perhaps you can.

The bottom line, after visiting the site, performing near-field RF level measurements, and talking to the operators and

Continued on page 37

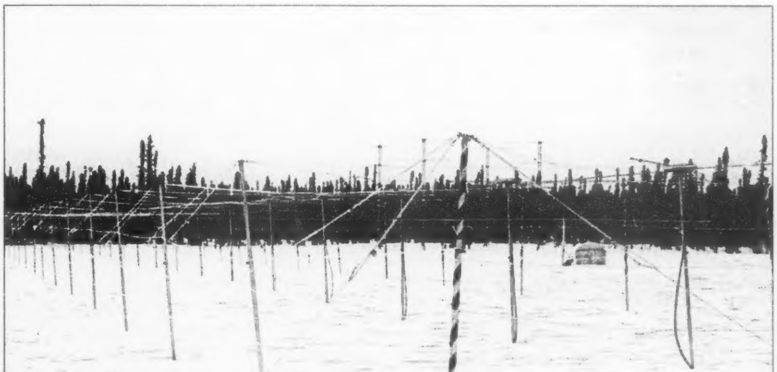

***Photo H.** Antenna field used to support riometer. This instrument will give a very good feel for the state of the ionosphere.*

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NEVER SAY DIE

continued from page 4

The head of the Rensselaer School of Management loved the idea and wanted to implement it. The next thing I knew, he'd inexplicably left.

Tumors

No matter how much the mobile phone industry hates it and is in public denial, two new studies have shown a clear connection between mobile phone use and brain tumors. Dr. Hardell, in Sweden, has shown that there is a 250% increased risk of a brain tumor for mobile phone users. The situation is even worse for children and young adults, where their cells are growing faster than in older people and are thus more susceptible to radio wave energy interference in their reproduction.

Dr. Preece, of Bristol University, found that a 20-minute use of a mobile phone changed people's ability to make choices that involve the visual cortex, the part of the brain which processes sight.

Dr. George Carlo, who worked for six years on a $25 million cell phone industry study, went on an ABC News report recently saying that there were two types of risk from using cell phones near the head. One is genetic cell damage and the other is tumor formation. To industry claims that scientists have found no direct evidence of risk, Dr. Carlo said that that was "actually quite shocking … knowing what has been conveyed to them."

If you are still using a cell phone, keep it short. Better yet, use the bag type with an antenna on top of the car.

If you have been convinced that your HT or a cell phone held up next to your head can't do any harm, you're another victim of a con job. Ditto if you believe the power company propaganda that magnetic fields from their power lines and distribution transformers are safe.

We are fortunate that the leading researcher in the world in this field is W. Ross Adey K6UI. Ross has been fighting the power and cell phone industries, trying to let people know the facts. But the money, and therefore the media attention, lies with the affected industries. There is no constituency for safety. So money, as usual, rules, in the media and with government agencies.

If you're interested in reading Ross' testimony before Congress on the subject, I've reprinted it for you. His testimony is backed up by his years of research, plus that of dozens of other almost unknown researchers.

Yes, cell phones are causing brain cancer. Yes, police radar is causing brain cancer, as well as testicular cancer, where officers rest the radar gun in their lap. Yes, kids are getting leukemia from power lines and transformers. Kids are particularly vulnerable because their cells are replicating faster than in adults, so the influence of magnetic fields on their cells is more evident.

Yes, microwave and UHF energy will affect your cells, and not for the good. It's not so much the microwave energy itself that's doing the damage, but the modulation.

Sure, your car will run fine if you only put a little sugar in the gas tank. At least for a while, but if you keep doing it, eventually the engine is going to stop. It's the same when we are poisoning our bodies, whether it's with sugar or magnetic fields.

Send me $3 for the reprint of Ross' Congressional testimony so you'll have the facts (see page 63, item #34). It's powerful stuff, but it's being lost in the blizzard of power and cell phone industry PR dollars.

Capitalism

The capitalist system seems to work pretty well. Well, it does as long as there is competition. But when some outfit manages to put its competitors out of business so it has a monopoly, the pressure to keep prices low and service high tend to disappear. In egregious cases, the government steps in and we have an anti-monopoly court battle, such as we've seen against Microsoft, and we've seen with AT&T and IBM.

If Congress ended the post office's monopoly they legislated on handling the mail, we'd see prices dropping and service escalating. Look at the computer field, where prices have been steadily dropping, while the product has been improving by leaps and bounds.

Then there's the school monopoly, where the teacher's unions are fighting hard, spending millions on lobbyists and deceptive advertising to prevent competition from charter schools or vouchers, and doing their best to make home schooling as difficult as they can.

How about the medical monopoly, with the AMA and the pharmaceutical companies in bed with the insurance companies and the FDA, providing us with the most expensive medical care in the world (by a wide margin), and one of the least effective. And all of this is with the connivance of Congress.

Our government is a typical example of a monopoly, with the price of its services going ballistic, and the quality of service into the pits—with the IRS pit bulls.

Lost & Found

A toddler who got lost in the wilds of northern New Hampshire was found by a woman who dowsed a topographical map. Her help was ignored by the search officials, but the state Fish and Game officers were persuaded to take her seriously and the child was found within the small circle she had drawn on the map.

A retired judge who has been dowsing for 35 years has found over 4,000 wells, seven missing persons and 150 missing pets. Another dowser has had 90% success in finding long-forgotten grave sites for descendants looking for their ancestors.

But then, if you are a skeptic, it's because you haven't read the books by Owen Lehto, Chris Bird, and Bevy Jaegers that I've reviewed in my *Secret Guide to Wisdom*. A good dowser can find anything, whether you believe in it or not. Further, this is a skill that just about anyone can develop.

Frustration

While it's fun being a guest on the Art Bell (W6OBB) radio talk show, I feel something like Ponce de Leon would probably have felt if he'd actually found the Fountain of Youth he was looking for all over Florida. "Hey, I've found the Fountain of Youth!" To which his audience would say, "Sure you have," as they went back to whupping slaves and pickin' cotton, or whatever.

About one out of every thousand Bell listeners gets in touch with me. Of those, about one in ten actually sends for my *Secret Guide to Health*. Considering that most catalogs pull about a 1% response, with 2% being considered outstanding, I should rejoice at 10%. But I'm greedy — not for sales of my book, which, for $5, is pretty much an at-cost item, but greedy in that I want to help more people to live longer, healthier happier lives.

Yes, I really have discovered the Fountain of Youth. It took several years of research, mainly because our so-called health care industry has done such a magnificent job of hiding the brilliant work of a few doctors. Plus, there's the political might of the pharmaceutical industry, the insurance industry, Big Tobacco, Big Food, Big Sugar, Big Chemical, and other Biggies to keep the truth from being known.

The nice thing about reading books is that they make it possible to learn from the world's top experts, instead of from some pontificating professor who is far more interested in research grants than those blank faces in his lecture hall. Or from some grad student "teacher" who doesn't know squat. As I've mentioned, in my four years of college I had exactly one interesting teacher. The rest were busy repeating what they'd been taught a generation earlier. For instance, the subject of quantum mechanics was never once even mentioned in any physics class! And this was in the 1940s in an engineering university!

Oh, I can understand why 99.99% of the people hearing me would be skeptical. What I've learned goes counter to what they've been taught to believe from earliest childhood. We *believe* in doctors. In hospitals. In chemotherapy and radiation for cancer. We *believe* that the standard medical approach to dealing with arthritis, diabetes, and so on *must* be right. So who is this Wayne Green guy who is trying to say that this is all horse pucky? Who's this guy who is trying to tell us that merely by changing our lifestyle we can get over virtually any illness and add 30–60 years of healthy living to our lives? What a crock!

I'm open to any ideas you may have as to how I can get the attention of the 99.99% of the people who need help, but are blind and deaf to my message.

I feel a terrible sadness when I see some bloated elephant of a woman heading for an all-you-can-eat buffet for her fifth plate. I feel it when I see hams at Dayton with grotesque bellies hanging over their belts. Or people hobbling along with walkers. When I visit nursing homes and see rows of Alzheimer's veggies.

It wasn't until I did the research that I found out what's gone wrong. Like everyone else I was busy poisoning my body with caffeine, mercury, root canals, NutraSweet, tons of sugar, and so on. I had no way of knowing what a sucker I was. I ate coffee and doughnuts at ham club meetings. I loved the free doughnuts the Dayton HamVention provided in the exhibitors' lounge. Now I'm busy doing everything I can to repair the 70-some years of damage I've unknowingly done to my body. It's quite a reconstruction project.

Have you some suggestions on how I might go about increasing the percentage of people I'm reaching with my message from 0.01% to maybe 1%?

Oh, Fig!

The Cleve Backster experiments with his philodendron that were reported in *The Secret Life of Plants* almost 25 years ago were recently replicated using a fig, as reported in the Spring issue of *The American Dowser*. A freshly picked fig was placed between two electrodes that were connected to a galvanic response recorder. When someone decided to cut the fig, as he reached for a knife the fig responded with a large pulse. Feeling sorry for the fig, he put down the knife, which resulted in a shorter galvanic pulse from the fig.

When the fig was asked if it could be eaten there was only a very tiny response. It didn't seem to mind.

Apparently distance doesn't make any difference, as reported by Backster. This was confirmed by Marcel Vogel, a senior research chemist for IBM's Advanced Systems Development Laboratories, who sent strongly focused thoughts to a plant in California from Czechoslovakia.

This would seem to be a wonderful area for exploration by kids looking for interesting science fair projects.

Good News!

One of the more valuable books reviewed in my *Secret Guide to Wisdom* is Chris Bird's *Secrets of the Soil*, which is a barn-burner. Unfortunately it's been out of print, so when I got word from the ASD Bookstore, 430 Railroad St #1, St. Johnsbury VT 05819, (800) 711-9497 (Wayne sent you), that they have the book in stock, that was great news! It's $20. The 442 pages are packed with fascinating information, much of it stuff you won't find anywhere else. If you're looking for interesting fields to experiment in or for a new product to sell, you'll find this a treasure.

As a matter of probably no interest whatever, the old name for St. Johnsbury was Sanger's Mills. My middle name, which my dad used, so I didn't, is Sanger. My great-great grandfather came over from Vermont to New Hampshire around 1820 and settled in Littleton. My great grandfather Sanger was a homeopathic physician — the town doctor.

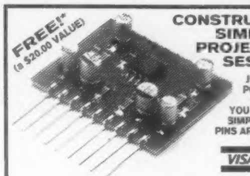
But don't let that stop you from reading this amazing book, okay?"

More Bad News

A fax from WA0KKC says that the local hamfest attendance as well as the exhibitors, both commercial and individual, were off at least 40% from last year and that 95% of those attending were old men. It looked more like a Social Security meeting than a hamfest. And who was everyone blaming? The ARRL! You can bet that many of the attendees and exhibitors won't be back if they try to run another hamfest next year.

Unless you are able to get your director to stop trying to discourage youngsters from getting involved with the hobby, we're goners. Demand that your director come to a club meeting and

Continued on page 20



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NEVER SAY DIE

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explain why he has done nothing to get the ARRL to promote the hobby.

When I got involved with amateur radio the average ham age was 28 and thousands of schools had radio clubs that were busy recruiting new blood and getting them licensed. The League, under the secret leadership of Mort Kahn W2KR, almost totally destroyed the school club infrastructure in 1964, and it's been downhill for us ever since.

How bad is it? I gave a talk to a ham club near Boston, and I was the youngest guy in the place.

Criminals

A recent Danish report (no, not the pastry) of a survey of 4,169 34-year-old males found a close correlation between their mother's smoking during pregnancy and their later persistent criminal behavior. The more the mother smoked, the more later criminal behavior.

Using Your Head

As A-Team's George Peppard used to say, "I love it when a plan comes together." Well, I feel like a physicist who's just developed a Theory of Everything, tying all the forces of nature (God?) together into one equation. Einstein's goal. Only this is a mental Theory Of Everything and it can, if you'll use it, change your life. And all it takes is five minutes a day! With an enormous amount to win and nothing to lose, I hope you'll put aside your usual skepticism and give this a try.

Each of the pieces of the puzzle has been making sense. For me, it's been something like putting together a huge jigsaw puzzle (which I love to do — particularly the wooden ones!). But, unless you've been reading the books I've been reviewing in my editorials, then recommending in my *Secret Guide to Wisdom*, and thus keeping up with the research I've been doing and the amazing things I've been discovering, you'll probably have a problem with accepting some of the jigsaw pieces I've fitted together.

For instance, one piece of the puzzle started with *The Secret Life of Plants*, where Chris Bird reported on Cleve Backster's research into plant-human communications, where plants were somehow able to sense what people were thinking. Then there was J. Allen Boone's *Kinship of All Life*, which explained how we can communicate with any animal, and even with insects! In Chris Bird's *Secrets of the Soil*, he explains that farmers have been able to get insects to leave their crops alone just by communicating with them.

I told you how I called Chris to find out what Cleve had been doing since the 1976 plants book. Chris put me in touch with Cleve, and he, in turn, steered me to Brian O'Leary, who had been working with him on human cells. Brian sent me *The Secret Life of Your Cells*. Wow! This book confirms that every cell in our body is in instant communication in some way with every other cell. And that's even when they're separated by thousands of miles! Well, this sure helps to explain the many weird reports from people with organ transplants, and even with blood transfusions and all those twins-reared-apart weirdness.

I've reported just recently on Neil Slade's book, *Mental Magic*, but I haven't yet included it in my *Secret Guide to Wisdom*. In it Neil explains how you can get clouds to change their shape, just by willing it. No, it doesn't work every time, but it does often enough to convince anyone who doesn't have a totally closed mind. It's a piece of the puzzle.

In *Secrets of the Soil* Chris discusses the power of thought (prayer) to influence the growth of seeds as well as plants. Prayer also is well known to help sick people to get better.

Then there's the work of Coué (1857–1926), who had millions of people telling themselves that "every day in every way I am getting better and better." The trouble with that was that it worked, much to the consternation of scientists, who in general don't want to have anything to do with the power of thought.

Scientists in general also don't want to know about the work of J.B. Rhine at Duke University, where he proved that thought can influence matter. This was recently proven again by the PEAR Lab at Princeton, and further confirmed mathematically beyond question by Dean Radin in his *The Conscious Universe*.

After Art Bell had Neil Slade on his show, Art decided to test the power of his audience's thoughts. At the time Texas was dry as a bone, with wildfires raging. He asked his listeners to pray for rain for Texas. Almost immediately Texas had a record downpour, which not only put out the fires, but flooded wide areas.

Art tried the experiment again when Florida was suffering from hundreds of fires, burning tens of thousands of acres. The resulting rain damned near floated Florida out into the Gulf. Art has wisely stopped the experiments.

You see how the pieces of the puzzle are starting to fit?

Next came a letter with a tape from a listener who enjoyed hearing me on

Art's show. The tape explained how you can make major changes in your body just by positively communicating with it. You start out by standing naked in front of a full length mirror. The most difficult part is telling each part of your body that you love it. Tell your arms that you love them. Tell your tummy the same thing. Your head. Your feet, and so on. Tell every part of your body that you love it. Then, every day, devote about five minutes to gently massaging each of your body parts, reaffirming your love.

Well, before you dismiss the idea, consider how cooperative someone you know would be if you let them know every day how much you hated them. You may hate having a big fat gut, but tell it you love it anyway. Tell it that every day. Then you'll see a miracle start to happen. You'll start losing interest in eating that bowl of ice cream. Or that slice of coconut custard pie. You'll be looking for a salad bar instead of the usual McDonald's trough.

After the trauma of my first divorce I started losing my hair. I've never really thought much about it. I haven't hated how I look, but then I sure haven't been proud of it either. One part of my body affirmation will be my love for my head of hair. Hey, and while you're about it, head, how about darkening some of that growing gray? My father and one grandfather had plenty of hair at my age. Dark hair. My mother's father's hair turned white and thinned out when he was young, so maybe I can trigger my father's genes? I've nothing to lose.

One thing I guarantee: If you follow through every day (not three times a week), you will see some amazing changes. Make notes and let me know, okay?

One more piece in the puzzle dropped into place when I heard the July 8th Art Bell show. He was interviewing Dr. Laura, who looks less than half his age. He just isn't aging. He explained that every cell in your body is in constant communication with your mind, so what you think of yourself comes across as orders from the boss. So, if you think you are ugly, you are going to be ugly. If you hate your fat body, you're on your way to being mistaken for a Goodyear blimp. If you have been convinced you are stupid, guess what?

Doctors and scientists like to think of the mind and body as separate. They aren't. Every cell in your body is part of your mind. Every cell is in communication with every other cell. Backster and O'Leary proved that.

Back when I first started writing editorials, almost 50 years ago, I explained that every physical illness had a mental component, and that if doctors would find it and decondition it, the illness would go away. No pills. No surgery. No shots. No return office visits. No further income.

When personal computers came along 25 years ago I explained in my computer magazine editorials that doctors needed a program which would help them isolate the contributing mental component of illnesses. Using a sensitive ohmmeter circuit, it would be simple for a computer to isolate the triggering mental component so the doctor could decondition it. As a mental repair technician 50 years ago I had no problem isolating these mental triggers and eliminating them, just by asking a few questions — and people would immediately get better!

Even Walt Disney has tried to get us to understand the power of the mind to improve our lives. One of my favorite songs is *When You Wish Upon A Star*, from *Pinocchio*. "When you wish upon a star, makes no difference who you are, anything your heart desires will come to you." The song has a powerful message — if you take it seriously. I did a short segment on a recent [www.rainreport.com] where I sang the song. I'll bet that surprised the heck out of anyone who listened to it.

This also explains how and why placebos work so well. If we believe something is going to work, our cells are going to take care of things from there on.

If you are still in denial over your ability to communicate with plants, insects, animals, and your body, I hope I can convince you to go the $5 for my *Secret*

Continued on page 48

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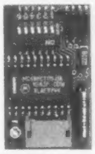

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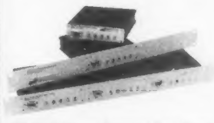

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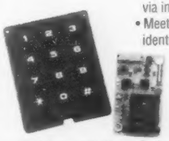

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Henry Falkner ZL1AAN
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It's the usual story. You look at some activity, and you think, "I would like to get into that, but where do these guys hang out?"

The first thing is to get hold of a program. Your ATV group may hand out copies of EZ SSTV, which is a good start. If you are on the Web, try entering this for a site (called URL):

[http://www.ultranet.com/~sstv/]

One of the clickable buttons gives you a list of programs for downloading. Most of these are shareware. They will work, but your transmission will show "UNREGISTERED," or something similar, in the header. Registering is not expensive, and you may get worthwhile support and updates.

The programs need decompressing after downloading, for which you need PKUnzip. There are different versions of PKZip (containing PKUnzip) for DOS, Windows 3.11, and Windows 95/98. Download also the instructions for your choice, and read them. Each version installs and works differently. If you cannot delete all the components of a PKZip installation that you stuffed, you may have to re-install Windows. Been there, done that. On the Web, try:

[http://pkware.com/shareware/]

You may need an interface. As a rule of thumb, for a 486 computer or better, but without sound card, choose one of the DOS programs. Some programs need a Hamcomm interface.

For reception, this uses an op amp to boost the receiver audio to RS232-compatible levels, which are typically ±12 volts. For transmission, there is a low-pass filter. The serial port must use a "Universal Adapter for Reception and Transmission" (UART), because it is

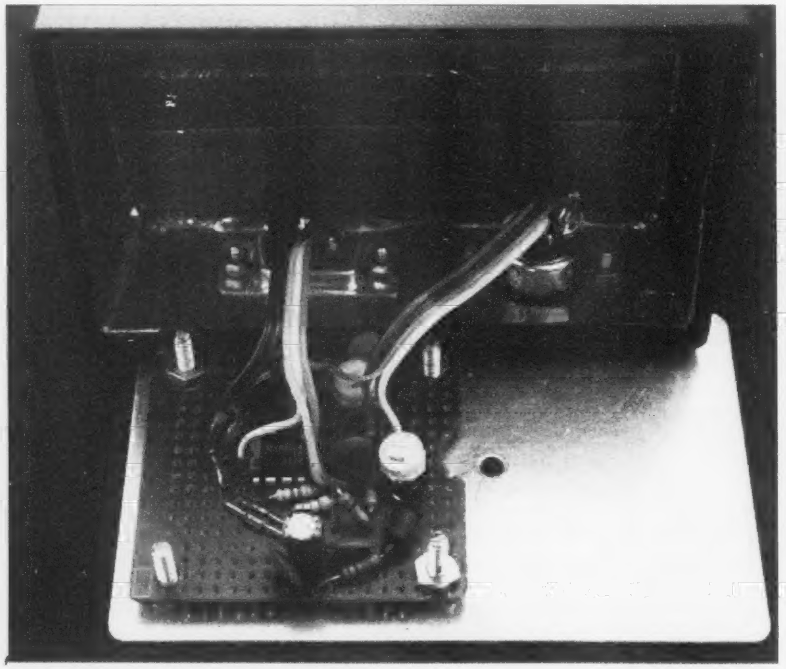

Photo A. *Author's home-made UART.*

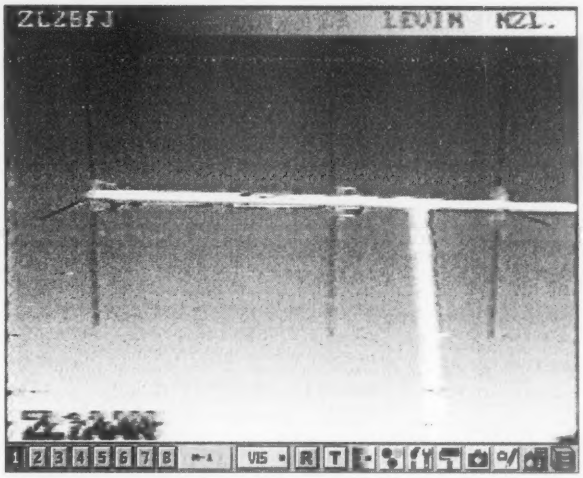
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Photo B. A very simple control screen, with one of my pictures after it was-retransmitted back to me.

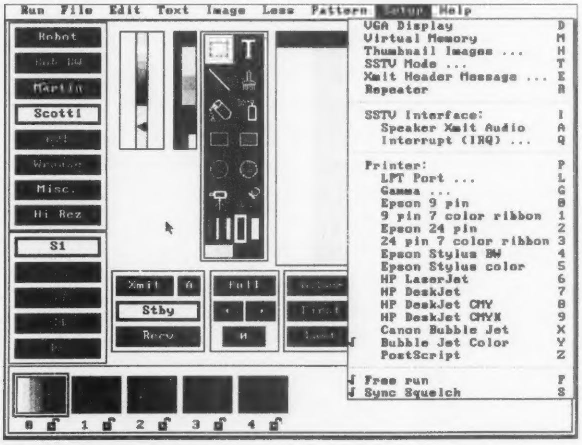
used as an analog-to-digital converter for reception, and as a digital-to-analog converter for transmission. Most IBM clones have a standard UART chip, but a friend found that his computer did not. The programs I have seen contained two circuit diagrams for this interface. I built mine on Veroboard in a box (**Photo A**).

Since with the Hamcomm interface the computer does all the work of moving pictures between the radio and the screen, some programmers, like the author of JVFax, gave the job of converting between analog and digital signals to an external interface, such as the JVF2. This interface also allows reception of weather satellite pictures direct. But it is getting hard to obtain, and there is a reason.

An increasing number of programs, both for weather satellites and slow-scan television, now use the computer sound card, preferably Soundblaster-compatible, for conversion between analog and digital signals. At a recent talk, Ian Ashley ZL1AOX said that most of these work, but some don't. He says that the main problems occur with laptops. If you are buying a new computer, try before you buy.

SSTV programs contain the information necessary to get going, in the form of at least one manual. You can get something on the screen after just loading the program, but you do need to know how to connect the computer to the radio, and how to get the pictures in step with your particular computer.

There is one series of programs with automatic synchronization that use DOS and the Hamcomm interface. These are EZ SSTV and Pasokon. EZ SSTV is a free, stripped down version of Pasokon, which has additional features worth getting. All you have to do is to receive a succession of pictures until the program tells you, it has sorted itself out.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Martin
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Misc.
Hi Rez
S1
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Full
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Thumbnail Images ... H
SSTV Mode ... T
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Repeater R
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Canon Bubble Jet X
Bubble Jet Color Y
PostScript Z
Free run F
Sync Squelch S
0 1 2 3 4

Photo C. The EZ SSTV screen with a simple video card.

The pictures are received and transmitted line by line, and each line has to start on the left of your screen. The program might look for the transmitted "sync pulse" at the beginning of each line. Unfortunately, many noises and clicks on the HF bands sound just like synchronization pulses. To get around this, SSTV programs use the computer clock instead. With computers now in use, their clock speeds vary between 66 MHz and 400 MHz, so your program needs to find that clock speed in the first place.

Without "synchronizing the program," you may be able to receive pictures with some programs, but not with others. When transmitting, however, your picture may be so badly slanted that your recipients may not even be able to tell you what is wrong. The motto then is, "If nothing else works, read the manual."

I don't use Windows programs myself, but I am told that all of them need synchronizing manually, by adjusting the slant of pictures received. I understand you need to press an OK button when you are satisfied, so you don't have to do the job each time after switching on the computer.

Another problem area appears to be the sound levels going to and coming

Continued on page 37

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Why Not Renew On-line?

Here's how to untangle the FCC Web.

Edward Oros AC3L
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If it's getting close to the time for you to renew your ham license, you'll find that you have more choices available to you now than the last time you filed. This time you can renew on-line. And you can do this within 120 days prior to the expiration of your license. As you may know, the FCC has been doing some consolidating of its many forms, and the old familiar 610 is going away. Even though amateur radio is not currently part of the new Universal Licensing System (ULS), the FCC does plan to implement the Amateur Radio Service as part of the ULS. You can read more about this at:

[http://www.fcc.gov/Bureaus/Wireless/News_Releases/1998/nrw18040.html] and [http://www.fcc.gov/wtb/uls/].

Meanwhile, the FCC does have a new form, the Form FCC 605. It replaces several existing forms, including the 610, 610R, and 610V. As of this writing though, the old familiar 610 was still available on-line. You can download the Form FCC 610 at [http://www.fcc.gov/Forms/Form610/610.pdf].

If you use this form, you should renew no sooner than 90 days before expiration of your license. But let's face it, the whole idea behind the Internet is fast communications. So instead of downloading a form and filing it by mail, why not just do the whole process all on-line. You should note that once your license has expired, you couldn't use the Form 900, even if your grace period has not yet expired. Currently, our grace time is a very liberal two-year filing period.

If you're good at following links and have some time to kill, you might just want to start at [http://www.fcc.gov/], the FCC home page. From there you can follow the various links to the help forms, download pages, and on-line filing. But to save a little time, you might want to follow this article to speed the process up a bit.

> ***A few minutes on-line, and you're covered for another 10 years of exciting hamming.***

One of the first pages you'll want to stop at is: [https://svartifoss.fcc.gov/prod/efpa/forms/900/900_Help.htm]. Here you'll find the instructions for filling out the Form FCC 900 over the Internet. Print this out first and have a copy in front of you when you are ready to file on-line. Also, as you visit some of the FCC pages you might want to download some of their other documents. Since the FCC has added pdf as one of the formats it supports for some documents posted at their Web site, you should read about the Portable Document Format (.pdf files) at [http://www.fcc.gov/pdf_ref.html]. This page also has a link for you to download a reader in case you don't already have one installed.

As for the actual filing, the FCC has provided links to their Form FCC 900 for electronic filing. To file on-line with form FCC 900, just connect to [http://www.fcc.gov/e-file/]. From here you can choose from two modes. There is both a normal mode and a secure mode in which to file. Just follow the links License Renewal (Form 900)/Normal Mode or /Secure Mode.

Choosing the normal mode link will take you to [http://svartifoss.fcc.gov:8080/cgi-bin/ws.exe/prod/efpa/forms/900/900_Form.hts].

The Secure Mode links to [https://svartifoss.fcc.gov/cgi-bin/ws.exe/prod/efpa/forms/900/900_Form.hts].

Should you find these links to be bogged down by the millions of people following this article, you can also get to the FCC 900 form via this FCC link:

[http://www.fcc.gov/wtb/electcom.html].

Here, under the heading of Electronic Forms, the following two sites (Site #1 and Site #2) also point to the form. The first is actually a repeat of the path I just mentioned above, and both seem to be secure connections to the form:

[https://svartifoss.fcc.gov/cgi-bin/ws.exe/prod/efpa/forms/900/900_Form.hts] and

[https://gullfoss.fcc.gov/cgi-bin/ws.exe/prod/efpa/forms/900/900_Form.hts]

If you're not sure when your license expires, you can still use this site to receive that information, too. Simply enter your callsign and click the "Continue" button. You'll receive a message similar to this one if it is too early:

Callsign AC3L expires on Jun 8 2009 11:59:00:000PM, it is too early to renew.

If you are within the renewal period, you'll be shown the Form FCC 900 on the screen. You should follow the instructions you've printed out and answer the appropriate questions. With the instructions in hand, you should have no problem filling out the form. The only area I had a problem with was block #14. It asks for a signature, but all you need to do there is type in your name. It's really a very easy process to renew. You should also note that you're allowed to use this form for changing your mailing address at the same time. Just enter your new address in item #4 and check the radio button in the Purpose of Filing box. (The instructions said Box 11 but my form had it listed as 12.)

After submitting your form, you may receive messages such as "can't find remittance ID ..." or "A notice that a fee is required for each submission ..." or even a message stating "A fee may be required ..." and that you should "... please continue to the fee Form 159..." I received all of these when I recently filed. These notices can be ignored if you're just renewing your license. The various fee requirements can be reviewed at [http://www.fcc.gov/fees/98wtbguide.txt]. As stated on this FCC page, "The regulatory fees do not currently apply to Amateur Radio Services (except vanity callsigns) ..." I've reported the problem, and hopefully these messages will only

Continued on page 38

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POWER STATION

Read All About It!

Part 1 of Techno-Trivia from The Hertzian Herald.

Dan Metzger K8JWR
6960 Steamview
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Anyone who has ever QSO'd G-land knows that our British cousins call a vacuum tube a valve, but did you know that they call a filter capacitor a reservoir capacitor? And they don't put up an antenna, they put up an aerial — the masts for which are held in place not by guy wires, but by stays. Also, they don't ground the antenna: They "earth" it.

A Brit doesn't plug in his rig to the AC line with a line cord. He connects it to the mains with a mains flex. If he needs lots of outlets, he doesn't use a cube tap or an outlet strip — he uses a trailing socket. And, of course, the mains are 50 Hz, 220 V. The standard *on* position for a switch in England is *down*, not *up* as in the USA.

On the bench, Tommy (the equivalent of our "Joe") uses not a protoboard, but a matrix board. And our "jumper wires" are his "wander plugs" or "flying leads." He spells "solder" the same, but pronounces it SOUL-der, not SAH-der.

The Aussies have a few tech terms of their own. My favorite is "Jack and Jill" for our "Jack and Plug." Others, which you should be able to recognize from the above discussion, are: bucket, spout, hill hoist, deck, and fencing wire.

The lowly resistor

We all know how to read the resistor color code — but do you know what it means when the first color band is double width? That indicates that the resistor is not carbon, it's wirewound.

When is a resistor not a resistor? When it's a capacitor.

Sometimes wire windings can produce enough inductance to cause real trouble at high frequencies. I recently measured a 5 ohm, 37 W wirewound that had 14 μH of inductance. At frequencies above 57 kHz, that "resistor" has more inductive reactance than resistance.

Some manufacturers reverse the winding direction halfway through to cancel the inductance. A 10 ohm, 20 W square wirewound I checked had less than 0.3 μH. Still, you should never use a wirewound resistor as a dummy load. Even 0.3 μH has over 50 ohms at 28 MHz.

Have you noticed that 1/2 W and 1/4 W resistors have changed shape in the last decade or so? They used to be perfect cylinders, but now they're dog-bone–shaped, with little bulges at the ends. The cylinders are carbon composition types. They have a central core of carbon mixed with clay. Best tolerance with these rascals was about 5%. The dog bones are carbon-film types. They have a thin film of carbon deposited on the surface of a ceramic cylinder, and easily hold a tolerance of 2%. You may see some of them with a red fourth band, indicating a 2% tolerance.

Getting back to color codes, the companies had a fit about 15 years ago, putting out resistors with a fifth color band, almost always yellow. This was just hype, crowing that the resistors pass a military-specified test with fewer than 0.001% failures per 1000 hours. And speaking of military, you may see resistors with values stamped on them — for example, 24R9. The R is the universal decimal point in resistance, so it's a 24.9 ohm resistor.

Reprinted with permission from *The Hertzian Herald*, newsletter of the Monroe County (MI) Radio Communications Association (MCRCA).

When is a resistor not a resistor? When it's a capacitor. Half-watt carbon-film resistors have typically 0.3 pF of stray capacitance between their leads. Half-watt carbon comps may have 1 pF, and 2 W comps may have 3 pF. Try to use a 91k-ohm and a 10k-ohm carbon comp to make a 10-to-1 voltage divider at 14 MHz, and you'll get a division closer to 2-to-1, from the 11k-ohm stray capacitance across each resistor. Try to make a 20 W, 75 ohm dummy load from ten 750 ohm, 2 W carbon comps in parallel, and you'll get a 30 pF of capacitance shunting the resistance. That's 37 ohms of reactance at 2 meters, and a 3-to-1 SWR!

Dit dit dah dah dit dit

Forgive me if I indulge in two of my favorite topics: CW and the history of radio. Did you know that Samuel "F.B." Morse did not invent the Morse code? He came up with the idea for a magnetic telegraph in 1832, and had a working version by 1837. For a code, he envisioned sending only numbers. The first five digits would be represented by one to five brief ON switchings of the current. He called the ON signals dots. For the digits 6 through 0, he proposed to use again a series of up to five dots, only these would have a much wider spacing between them, since operators might lose count if ten dots were required.

Every word in the language was then to be assigned a number, which would be sent to represent the word. Morse was nearing completion of his word-to-number and number-to-word dictionaries in 1844 when his assistant, Alfred Vail, came up with a new idea for a code using dots and dashes to represent letters. In fact, it used three ON lengths (dots, dashes, and long dashes) and four spacings (short or long spacing between elements of a letter, a longer space between letters, and a still longer space between words). This became the American Morse code. You can still hear some old-timers using it on 80 and 40 meters.

Most Old American Morse letters are the same as the new International Morse letters we are familiar with. Here are some that are different:

C didit-dit
F didahdit
L daahhh
O dit-dit
P dididididit
Y didit-didit
3 (numeral) dididdahdit
question dahdididahdit

Note that didit (short space) is I; dit-dit (long space) is O; and dit dit (longer space) is two letters (EE) in succession. The rhythm of the Old Morse C is familiar to us in the last three dots we send for DE, meaning FROM. A very long dash is letter L, which is also used for numeral 0. (If you thought it was a clever timesaver to send a single long dash for a zero, Vail thought of it a century and a half ago.)

American Morse was the standard in the days of spark, and wasn't effectively replaced by International Morse until tubes took over about 1920. The surviving wireless operator of the *Titanic* (1912) complained bitterly about rescue operators who knew only American Morse.

If we could go faster than light, would time run backwards?

Our SK, meaning End of Work, comes from American Morse. The numerals 30, long used by newspaper copy editors to mark the end of an article, come out didididahdit daahhh in Old Morse. We simply closed it up to didididahdidah. Our ES for AND is not borrowed from another language, as many assume. Old Morse has a separate symbol for the ampersand (&), which is dit-dididit. (By the way, the name ampersand comes from a slurring of British schoolchildren reciting the alphabet and tacking on at the end, "and per se, and." Per se is Latin for "by itself.")

Frustrated telegraph ops often sent DAMN, which they shortened to DN. To avoid trouble in a Victorian era, this was copied on the message pad as a question mark or a slash. In American Morse, dahdididahdit is now the

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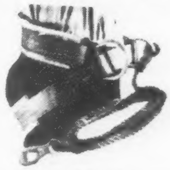

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official question mark, while for us it is the slash.

Like the word HAM itself, the word LID, meaning a poor operator, has several contending explanations. One is that new Morse ops would attach a tobacco can lid to their sounder to get a ring that could be distinguished from the clacking of other sounders in a crowded telegraph office. Another is that it is simply a contraction of LIfteD, a slang term applied to an operator who had been taken out of a main office and sent to a backwater station where he could cause less trouble.

For a closer, how about some CW information you can use? If you've wondered how fast you're sending and want a quick way to check it out, send THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG (no period). There are 35 letters, equivalent to 7 five-letter words. If you send it in 60 seconds, that's 7 wpm — good enough to pass the Novice test with room to spare. If you send it (and receive it) in 30 seconds, that's 14 wpm, and you're ready for the General. Do it in 20 seconds, and you're at 21 wpm — time to upgrade to Extra!

Which way did it go?

The surest way to start a fight among electronics types is to ask which way current flows. It all started when Ben Franklin was corresponding with experimenters in Europe about electric phenomena. Everyone realized that there were positive and negative "electric fluids," which they called vitreous and resinous. They knew that these "fluids" flowed from one to the other — although no one could say which way. Franklin proposed the "convention" that they would speak of the fluids as flowing from positive to negative, and everyone agreed.

The telegraph was invented; Maxwell developed the electromagnetic theory; telephones, light bulbs, and electric railways came into use — all explained by the ideas of electric fluid and Franklin's convention. Then, in 1898, Thompson (not Lord Kelvin; another Thompson) discovered the electron, and it soon became clear that the "fluid" consisted of negative particles, and that (in a copper wire, at least) they flowed the opposite way from Franklin's convention. Before 1920, it was clear to everyone that explanations of the vacuum tube made no sense at all using conventional flow, and many books began teaching that current consisted of electrons going from negative to positive.

Still, the electrical engineering community stuck with the conventional (positive-to-negative) flow that had served them so well in the past. Patience paid off, because when the transistor appeared on the scene it had to be explained partly in terms of "hole" flow from positive to negative … just like conventional current. (To visualize hole flow, think of a bubble floating up in a glass of beer. Gravity pulls the beer down, which makes the bubble go up.)

Today, we have such powerful groups as the US Navy teaching electron flow, and the IEC (International Electrotechnical Commission) teaching conventional flow. Some of the most popular Community College electronics books are actually available in two versions, so they can sell to instructors with either prejudice. So, which way do I teach? I always answer that question with a little story:

Three applicants were waiting or a job interview. One was a business graduate, and when he went in, the boss asked, "How much is 2 + 2?" The business grad said, "You have to consider the increased marginal tax rate when combining assets, so it is likely that …" The boss interrupted and said, "That's very astute. We'll call you."

The second applicant was a math major, and on being asked the same question, he relied, "If you mean 2.000 plus 2.000, then the true sum lies between 1.999 and 2.001, but if you mean …" But the boss cut him off and said, "Very intelligent. We'll call you."

The third applicant was a technician, and when he went in the boss asked, "How much is 2 + 2?" The technician replied, "How much do YOU want it to be, Boss?" Of course, he got the job.

Now, which way does current flow? Better learn both ways, and then be ready to do it the boss's way!

"That's unreal!"

In the last section, I noted that the world of electronics is divided into two armed camps — electron flow adherents versus conventional flow (positive-to-negative) partisans — and I attempted to steer a neutral course between the two. Such fence-sitting seems to anger some folks, who feel that electron flow is "the truth" and that common sense should move all but the perversely stubborn to discard conventional flow as a manifest error.

Ah, if only subatomic phenomena were simple matters of black and white. As a common-sense example, do you see the letters on the page in front of you? It is conventional and convenient to say that we see them but, of course, the letters are black and reflect no light. We see the white paper, and *don't* see the black areas that comprise the letters. Shall we condemn all those who refuse to acknowledge their error and continue to speak of seeing the letters "black on white"?

Another example of mistakenly applying common sense to subatomic phenomena is the assertion that AC doesn't "really" flow through a capacitor, because the insulating dielectric prevents the electrons on one plate from passing through to the other plate. A zillion electrons may flow into the negative plate, but it is *different* zillion electrons that flow out of the positive plate. If we could paint the electrons on one side blue, we would see no blue electrons coming out the other side.

The error in this argument is that you *can't* paint an electron blue, or carve your initials on it, or distinguish it in any way. Every electron is exactly identical with every other electron, so arguments based on suppose distinctions are nonsense — and AC "really" does flow through a capacitor.

I often hear a similar argument from beginning physics students when they learn that time slows down at relative velocities approaching the speed of light. They ask, "If we could go faster than light, would time run backwards?" I reply that you can't go faster than light, because mass approaches infinity and acceleration under any force goes to zero. They come back with, "But if you *could* go faster than light ..." Whereupon I am forced to answer, "Well, you can't, so let's stop talking nonsense."

Additional absurdities crop up in discussing what an atom "looks" like — the color, shape, and surface texture of an electron, for example. To look at a single electron, you have to throw a photon of light at it, which will knock it silly. A single electron doesn't "look" like anything, nor does it have a surface texture or a color, both of which imply an arrangement of many atoms together.

We use mathematical models to describe how electrons behave in response to various forces, but human experiences of time, size, and weight have nothing in common with an electron. When we attempt to apply "common sense" to phenomena that are completely outside the realm of the common experiences of our five senses, the result is likely to be nonsense. 73

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Joyce Ann Seay AD4EX
1105 Ridgecrest Drive
Dickson TN 37055

Everyone becomes involved in amateur radio for her own reasons. When I first got involved, it was because my husband, Charles Seay KN4HL, was involved, and I wanted to see what it was all about. He had been a ham as a youngster and had not been active for a long time. After we married, both for the second time, I encouraged him to get back into amateur radio. I never dreamed at the time that I was setting in motion something that would have a profound impact on my life.

Not long after my husband got back into the hobby, he and some other hams in our area started a club. I was surprised that there were some women involved, and decided to go to a meeting to see what was going on. I met some of the nicest people I had ever met. About that time, my husband first suggested that I might want to get my license. I wonder if he realized that he had opened Pandora's Box.

Back in those days, the only entry license was the Novice Class. The theory wasn't bad, but I soon formed a distinct dislike for Morse code. Thanks to the Gordon West's tapes, I finally was able to pass my 5 wpm and become a Novice. I had no ambition to ever upgrade beyond that.

My license had been framed and hanging on the wall of the shack, alongside my husband's, for about a month, and I still hadn't made a contact. He was on 10 meters one night and called me into the shack. He said someone wanted to talk to me. I reluctantly took the mike and had a brief QSO with a ham in Minnesota. To my amazement, people from all over the country started calling me. I spent the rest of the evening on the radio. That night I fell in love with 10 meters. I soon had taken over the shack, and my husband had lost his radio. I was perfectly content with my Novice license. At that time, 10 meters was open around the world, and I soon had QSL cards coming in from the four corners. As the saying goes, "My husband used to come home to a hot meal and a cold radio, now he comes home to a cold meal and a hot radio."

I soon had taken over the shack, and my husband had lost his radio.

About that time, our area got a two meter repeater. Now all the hams were hanging out on two meters, so I got my Technician Class license. No code to pass on that one, so I was happy. After I upgraded to Tech, I started thinking about General. I had passed the 5 wpm, so how hard could 13 be? Right! But as they say, "fools rush in," so I did.

Once again, I was spending lots of time with Gordon West. Now my husband came home to a kitchen table littered with code practice sheets and no dinner at all. I literally had code on the brain. Everything I saw I would translate into code. I even started dreaming about it. On my second try, I passed the 13 and got my General. I was one happy camper!

Now, of course, I had to get the Advanced. Just theory. Well, the theory was getting pretty deep, but I hung in there with the thought—at least there wasn't any code—and I soon got my Advanced Class license. I had gone from KC4RNX to KQ4FI. I wasn't really happy with my call, and my husband, always one to be helpful, suggested that if I got my Extra I could

Continued on page 38

Secrets of Transmission Lines

Part 5: Impedance and reflections, including a "kitchen table" experiment.

John A. Kuecken KE2QJ
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Pittsford NY 14534

In the last part, we dealt with transients flying up and down the transmission line and saw the fact that a solid termination (being tied firmly to a tree) would cause a reflected wave to appear. In this chapter, we will be examining the effects of the line with a steady-state AC excitation.

Going back to the telegrapher's equation, let us make a substitution to simplify writing some of the relationships. To begin with, let:

$A_f = [t - (x/v)]$
eqn (5-1)

and

$A_r = [t + (x/v)]$
(5-2)

This is simply a shorthand to simplify the printing of the equations. Note that we will change A_b (backward) to A_r (reverse). As noted previously, equation (5-1) implies that the farther to the right we choose x, the younger or earlier will be the forward wave at that point. Conversely, equation (5-2) tells us that the farther to the right we choose x, the older the reflected wave will be at that point. Restating in another fashion, A_f travels left to right and A_r travels right to left.

Now, harking back to part 2 and Euler's equation, we recall that we can describe a sine wave with the term

$\exp(j*w*t) = \sin(w*t) + [j*\cos(w*t)]$
(5-3)

where:
exp( ) is the log base epsilon

We had noted earlier that E_f and E_r could be functions of time. If we choose to make them sinewaves, we can write equations (4-3) and (4-4) as:

$E = E_f*\exp(j*w*A_f) + E_r*\exp(j*w*A_r)$
(5-4)

and

$i = (E_f/Z_0)*\exp(j*w*A_f) - (E_r/Z_0)*\exp(j*w*A_r)$
(5-5)

This describes the forward and backward waves at any instant in time and at any location on the line.

Reflections on the line

It seems fair at this point to ask where the reverse wave comes from. The answer is most generally from reflections. It is possible to excite a line at both ends; however, it is seldom advantageous to do so. On the other hand, any departure from the uniform characteristics of the transmission line will generate a reflection or a backward wave of some amplitude and phase.

To begin with, let us consider the extreme case in which the far end of the line is short circuited and the resistance of the short is zero. It should be obvious that no amount of current flowing in the short will generate a voltage at the short. Therefore, the reflected voltage must completely cancel the forward voltage and must be 180 degrees out of phase with it, or $E_r = -E_f$. The current in the short will be twice the forward current.

For the converse case in which the line is open circuited, the current must be zero, since no amount of voltage can make a current flow in the open circuit. To drive the current to zero at this point, we must have the forward and reverse current waves equal and in phase; therefore, $E_r = E_f$. The voltage at this point will be twice the forward voltage.

In the third case, where the termination is a resistor equal to the characteristic impedance of the line, there is no reflected wave and $E_r = 0$. As noted previously, no electrical measurement on the line itself from the sending end can distinguish a perfectly matched line from an infinitely long line. I suppose that someone will point out that if the perfect termination on the far end of the line was an antenna, then we could receive the signal and, using some modulation scheme, determine the total time of flight. Picky! Picky!

The quantity E_r/E_f is termed the voltage reflection coefficient. As we have seen, it can vary between a -1 and a +1 and can also be zero. The voltage reflection coefficient is usually represented by the Greek letter Gamma Major. Consider the illustration in **Fig. 1.** It shows two vectors representing E_f and E_r rotating in opposite directions as a function of A_f and A_r. Since we are interested in the steady-state condition, we may drop the (j*w) term and concern ourselves with the long-term average.

With a little thought about it, we can see that these vectors rotating in opposite directions at the same speed will fall atop one another twice per revolution and will oppose one another twice per revolution. In other words, twice per wavelength on the line you will find a voltage peak where E_f and E_r add, and twice per wavelength you will find a place where they cancel and there is a voltage minimum on the line. The ratio between these amplitudes is commonly referred to as the VSWR or Voltage Standing Wave Ratio:

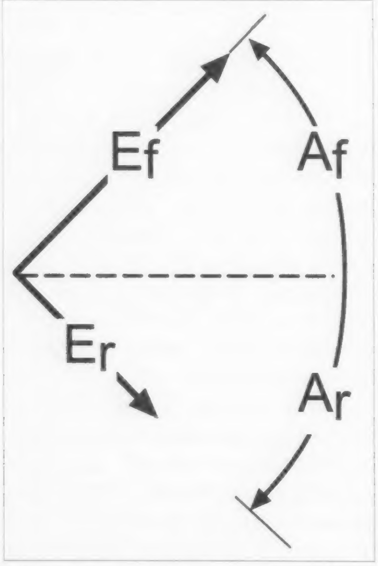

Fig. 1. Rotation of $E_f + E_r$ with $A_f + A_r$.

$$VSWR = (E_f + E_r)/(E_f - E_r)$$
(5-6)

$$VSWR = (1 + gamma)/(1 - gamma)$$
(5-7)

Note that with a little algebraic manipulation we can re-arrange equation (5-6) to:

$$E_r/E_f = (VSWR - 1)/(VSWR + 1)$$
(5-8)

Since both E_r and E_f are across the characteristic impedance of the line, the power in the forward and reflected waves is proportional to the square of the voltages. Therefore:

$$Pwr_r/Pwr_f = (VSWR - 1)^2/(VSWR + 1)^2$$
(5-9)

Most solid state ham transmitters will start shutting down power at a VSWR of two or so. This corresponds to:

$$E_r/E_f = (2 - 1)/(2 + 1) = 1/3$$

Thus the power in the reflected and forward waves is:

$$Pwr_r/Pwr_f = (1/3)*(1/3) = 1/9$$

The backward wave has a third of the voltage and a ninth of the power. It is noteworthy that many of the very broadband military and commercial antennas — covering perhaps 2 to 30 MHz or 225–400 MHz — have VSWRs that seldom get any better than 2:1 or 2.5:1 The characteristics of log periodics and discones and traveling wave helicals include a VSWR that simply does not get below these levels. In order to obtain the continuous coverage (any frequency within the range), the military equipment simply puts up with the VSWR.

Line impedance

Impedance is defined as the ratio of voltage to current, and we saw with our short circuit example that at the short circuit and every half wave down the line toward the source, or sending, end, the voltage is zero and the current is maximum. This corresponds to an impedance of zero.

Conversely, at the open circuit the voltage is maximum and the current is zero, and this repeats itself every half wave toward the source. The current zero and voltage maximum correspond to an infinite impedance.

In this case, with an infinite VSWR, the impedance of the line is cycling between zero and infinite impedance along its length every quarter wave. Measuring with only a single frequency, it is not possible to tell the difference between a short circuit an even number of quarter wavelengths down the line or an open circuit an odd number of quarter wavelengths down.

When the VSWR is more reasonable, it is perhaps not quite so obvious, but at every voltage maximum the current will be minimum, and the impedance will be maximum and furthermore will be a pure resistance equal to $VSWR*Z_0$. At every voltage minimum, the current will be maximum and the impedance will be minimum and a pure resistance equal to Z_0/VSWR. At all other points on a mismatched line (meaning VSWR > 1), the impedance will have a reactive component as well as a resistive component.

As an example of this, on a 50 ohm line (Z_0 = 50 ohms), if we measure the forward power as being nine times as great as the reflected power we know that the VSWR is 2:1 from equation (5-8). This would tell us that at the voltage peaks the impedance is 2*50 = 100 ohms, and at the voltage minima the impedance is 50/2 = 25 ohms.

Fun with standing waves

Having been through this discussion, let's have some fun with standing waves. To do this, you will need a 2 meter transmitter of some sort, some lengths of RG-58 cable or equivalent, a length of TV twinlead cable, and a diode voltmeter. We will be measuring the standing waves on the TV twinlead because it is easy to see them there. On coax, the standing waves are on the inside and not accessible except with a slotted line.

The first thing to do is to build a balun to transform the unbalanced coax into a balanced structure for the TV twinlead. Do not neglect this step, because if you directly connect the coax to the twinlead you will have RF all over everything and will measure nothing.

The balun shown in **Fig. 2** consists of a half wavelength of coax bent into a "U" and attached to a coax line of essentially any length with a fitting to connect to the transmitter. At 146 MHz with RG-58 cable having polyethylene insulation, a half wave is approximately 26 inches. If you have Teflon-insulated cable, the length is approximately 28 inches. Add about an inch for connections. You will find this job easier to do if you have cable with honest braid and not aluminum foil. Strip the jacket back a half inch on both ends of the "U" and the end of the feed cable.

Connect the outer conductor of one end of the "U" and the outer conductor of the feed cable together with a wire binding as shown in the figure. At the same point, connect the inner conductors together, being careful to avoid shorting them to the outer conductor. The TV twinlead will attach with one conductor attaching to "A" and the other attaching to "B".

If you happen to have a UHF directional coupler, the assembly should show a low VSWR measuring on the feed cable with a 200 ohm carbon resistor between points "A" and "B". The resistor must be carbon or film and definitely not wirewound. If your transmitter power is more than a watt or so, it may be necessary to parallel several resistors as described in part 1 to obtain the 200 ohms with an appropriate power rating.

Next, cut a length of TV twinlead about 10 feet long and strip about a quarter inch of wire on both ends. If you have a plank that length, you could tape the twinlead down every six inches or so. If you don't have a plank, you can stretch it out on a table. Don't let the twinlead lay on or cross a conducting surface.

The resistive net is intended to prevent your transmitter from looking into impedances that might damage it. For most handhelds on low power, a one watt size will suffice for the 200 ohm resistor, and half watt sizes will do for the 51 ohms.

The final item is the detector. We would like to have a detector that will be sensitive to the voltage difference between the conductors, and insensitive to the voltage to ground that the conductors have in common. The common mode voltage or common voltage to ground will arise only because of an imperfect action of the balun. It does not participate in the transmission line action and serves only to confuse the measurement.

The detector circuit shown in **Fig. 4** is intended to suppress common mode voltages and to respond to line-to-line voltages. The square object represents a piece of printed circuit board about

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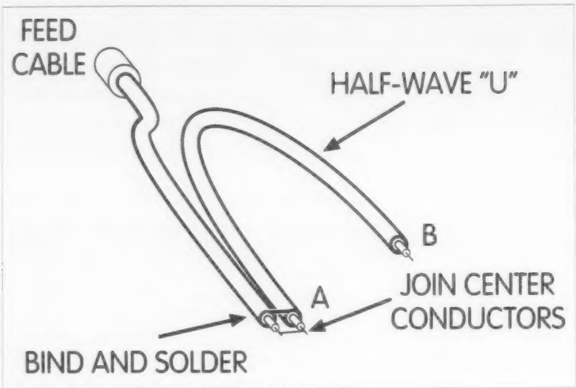

***Fig. 2.** Half-wave balun.*

1/2 by one inch. With a sharp knife, cut a slit down the center and check with an ohmmeter to make sure that the two halves are electrically isolated. The four diodes represent a bridge rectifier.

You cannot use a made up power bridge or power rectifiers like 1N400x at two meter frequencies. The bridge works best with UHF germanium diodes; however, it will function with high speed switching diodes like 1N914 or 1N4146. A zero-to-1-mA meter movement will function satisfactorily for the detector, and the resistors should be selected to give about a half scale reading on a matched line.

The foam guide on the probe is intended to hold the probe in a constant relationship to the line as we slide the probe along the line. You probably will have better results if you firmly mount the components on a circuit board and provide a wooden handle to keep your hand six or more inches away from the line as you slide the detector along.

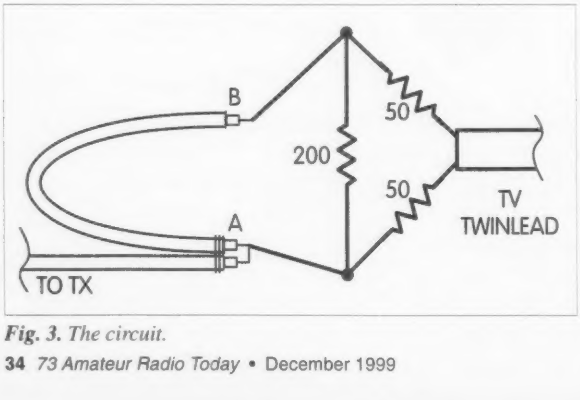

***Fig. 3.** The circuit.*

Now the experiments

TV twinlead is nominally 300 ohms in Z_0; therefore, let us start by terminating the far end (away from the balun) with a 300 ohm carbon or film resistor. Keep the leads as short as possible. With the transmitter running somewhere around 146 MHz, you should have a reasonably flat response from the detector. The meter reading should be more or less constant no matter where on the line you slide the detector. Because of the relative crudeness of the construction, do not be too surprised if you find a variation of 4% or 5% in the readings.

Remove the resistor and leave the line open-circuited. This time you should find a very pronounced standing wave on the line. The voltage will be high at the open end and will fall sharply to near zero a quarter wave toward the sending end and a half wave beyond that. Take some masking tape and mark the places where the voltage minima were, and identify that these are for the open circuit.

Next, solder a short circuit across the end of the line. Don't just twist the wires — solder a jumper in place. This time the voltage at the short will be near zero and the next minimum will be a half wave toward the sending end. Mark and identify these as before. The distance between minima should be the same for the short circuit case as it was for the open circuit case, and the minimum for the shorted case should lie very close to being centered between the minima for the open circuit case. We will explain the "very close" as opposed to "exactly" shortly.

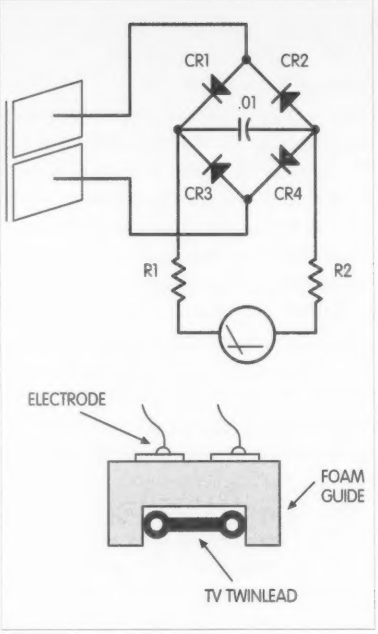

***Fig. 4.** The detector.*

Next, let us replace the short with a 100 ohm carbon or film resistor. In this case, the VSWR will not be nearly so high and, as a matter of fact, should measure 3:1; that is, the peak voltage should be three times as great as the minimum and the minima should lie almost exactly on the marks for the short circuit.

Finally, replace the resistor with a 600 ohm resistor. In this case, the VSWR should measure 2:1 and the minima should lie close to those for the open circuit case.

Conclusions

These experiments were intended to prove that:

(1) The point of minimum voltage on the line is always resistive.

(2) The impedance on the line at the voltage minimum is Z_0/VSWR.

(3) A line terminated in its Z_0 has no standing waves.

If instead of measuring voltage we had measured current, we could also have shown that the points of minimum current are resistive and equal to Z_0 *VSWR. Our measurements paid little attention to finding the voltage peaks

Continued on page 38

Need a UHF Dipper?

Part 3: Mods for using the tuner as a dipper.

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1411 18th Street
Manhattan Beach CA 90266-4025

Parts 1 and 2 of this series provided discussions regarding the theory of a TV tuner's resonator, frequency measurement techniques, and how to couple the oscillator to an outside environment. This is the final part in the series, which will discuss the modifications that may be used to utilize the tuner as a dipper, and to shift the operating frequency into an adjacent ham band.

Modifications

As pointed out earlier, modifications to the oscillator circuit should be performed only as required for getting the oscillator to operate within a desired frequency band. I've assumed that most applications involving the dipper are for the 450 MHz band, so the emphasis has been placed on attempting to lower the operating band.

But for those who are interested in moving the dipper up into the 902 MHz region, the modification primarily requires reducing the capacitive top loading marked as "padding" as shown in Part 1, Fig. 2. Reducing the capacitive bottom loading will also assist in raising the operating frequency, but at a lower percentage of effect than that controlled by the top loading. It might be necessary, as a last resort, to remove capacitor plates in order to reduce the top loading sufficiently to gain the desired upper frequency. The capacitor plate removal must be done gingerly, to protect the ceramic insulators. In addition, applying the oscillator's supply voltage directly to the varactor's control terminal may decrease some bottom loading.

Each modification to be discussed will be progressive, starting with the simplest and progressing to the one requiring surgery. Again, surgery should be avoided if at all possible in order to preserve the dipper's integrity and operation, even if the dipper remains a little high in frequency.

(1) The first modification is to solder a phono connector to the oscillator wall (refer to Part 2, Fig. 2). The sense loop connection scheme will have to be worked out at this step. However, one of the schemes may be used temporarily while lowering the oscillator's frequency, as indicated in the step below. Once the operating frequency has been established, then the experimentation must begin to find the best sense loop scheme.

(2) Increasing the top loading on the resonator can be accomplished by tacking a padding capacitor between the variable tuning capacitor and the top of the oscillator wall as shown in **Fig. 1.** A suitable capacitor, as shown in **Fig. 2**, has a value range from about 0.5–15 pF. Piston and small adjustable ceramic capacitors are best suited for this application, but disc ceramic and tubular ceramic fixed value capacitors may also be used.

With the capacitor adjusted for minimum capacitance and tacked into place, apply supply voltage to the oscillator and monitor the activity as observed on the meter. Adjust the tuning capacitor to the lowest frequency, then

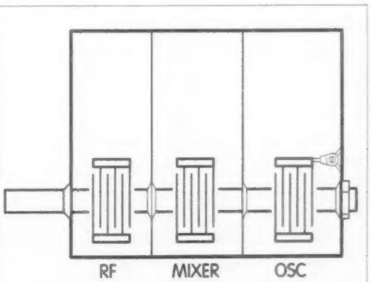

Fig. 1. Increase in top loading using a small variable capacitor.

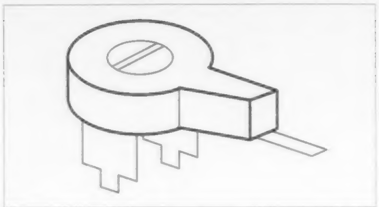

Fig. 2. Typical trimmer capacitor used for top loading. A suitable capacitance value is about 0.5–15 pF.

raise the frequency while observing the meter. If the meter indication is low or zero at the lowest frequency, and then suddenly pops upward as the frequency is increased, then it's possible that there is insufficient oscillator feedback.

Not all tuners fail when the capacitive top loading is increased and the lowest operating frequency attained could easily be in the 430–440 MHz region. Assuming this to be the case, then measure the upper frequency to see that it is above 450 MHz. By adding top loading capacitance, the total tuning range of the oscillator will be narrowed because the percentage of total capacitance that remains variable is reduced. As an example of what happens, the original tuning range was perhaps 470–900 MHz. Lowering the bottom to, say, 440 MHz, the upper frequency may have dropped to perhaps 460 MHz. If the resulting tuning range is acceptable, then adjust the padding capacitor slightly to center the tuning range within the desired operating band.

I've found that once the final padding capacitance has been determined, replacing the variable with a fixed value capacitor of the same value works very well. Typically, the capacitance value will fall within the range of 1–5 pF. Disk ceramic and tubular ceramic capacitors are a good choice.

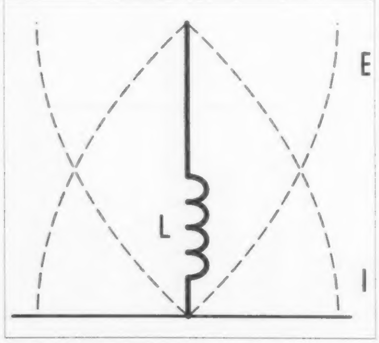

Fig. 3. Adding inductance (L) near the bottom of the resonator effectively lowers the resonant frequency.

(3) Some tuners have a loop of wire (or stamped metal) mounted near the oscillator's resonator. The loop is grounded on both ends, and as such becomes an inductor that is placed in the I field of the resonator for inductive loading control. Moving the loop closer to the resonator will raise the operating frequency, and moving it away will lower the frequency. When modifying the tuner-dipper for the 450 MHz band, the loop should be pushed flat against the metal wall. If the modification is being considered for the 902 MHz band, then the loop may be made closer, if necessary, to the resonator to increase the operating frequency band.

(4) The fourth level of modification involves increasing the oscillator's feedback. A common-base Colpitts oscillator, as used in a UHF TV tuner, is dependent upon the capacitive coupling between emitter and collector terminals. I've been successful in increasing the feedback with some tuners, while others appear to have sufficient feedback already and there is no additional reaction to the increased feedback attempt.

If it's necessary to increase the feedback, locate the transistor's emitter lead that has a resistor connected between the emitter lead and ground. Solder a piece of small wire (bare or insulated) onto the emitter lead and allow it to extend upward. The length of the added wire should be between 1/4 and 1/2 inch. With power applied, use a thin wooden stick or plastic rod to move the tip of the wire toward the collector terminal without actually touching the collector. Observe the meter and the indicated oscillator level as the wire is moved. If the level increases, then proceed some more. Moving the wire from side to side while advancing toward the collector helps locate the point of greatest feedback. Rotate the tuning capacitor and observe the amplitude reaction. In some cases there will be an amplitude increase across the tuning range, while in others, the amplitude variation swing will be greater. Choose the best compromise for the desired band segment.

Should there be no additional reaction or no reaction at all, or an adverse reaction occurs, then cease working with the feedback. Remove the wire lead if necessary to restore the "stock" feedback.

(5) The fifth level of modification is to work with the capacitive bottom loading. Some tuners have built-in piston trimmer capacitors so that bottom loading can be used to "trim" or position the frequency band. Increasing the capacitance value of the trimmer capacitor results in lowering the oscillator's frequency. Because the oscillator transistor and the trimmer are essentially in parallel, increasing the capacitance value too much will "kill" the oscillator's feedback. It may be desirable to attempt increasing the feedback as indicated in step 4 above.

When a trimmer capacitor is not provided on the tuner, one may be added, if desired, by tacking a trimmer between the transistor end of the resonator and the edge at the nearest wall. A suitable trimmer capacitance value is in the range of 0.5–5 pF, which is sufficient to evaluate the effectiveness of bottom loading. Care must be taken when working on the transistor end of the resonator because of the very limited space that is available.

As an example, when moving the oscillator up into the 902 MHz band, should it be desired, a small measure of reduction in bottom loading capacitance may be accomplished by applying a voltage to the varactor control terminal. Jumpering the control terminal directly to the +VCC lead will accomplish the task.

(6) The last modification, one requiring surgery, should be avoided unless it is the last resort.

BEWARE! Performing surgery on the tuner may render it useless.

To gain a perspective of what's required, let's return for a moment to the theory of the resonator. We attempted to lower the frequency of the resonator by adding capacitive top loading, and that failure required a more extensive modification. The next attempt lies with increasing the inductance value of the antenna element. **Fig. 3** depicts the desired E and I fields that will support the objective.

Again, in looking at the resonator as a quarter-wave antenna, the electrical length can be increased (lowering of the resonant frequency) by inductively loading the element. Inductance has the greatest effect on the antenna element when it is operating in the I field. The magnitude of the I field is the greatest at the ground end of the resonator, indicating that the added L should be placed as low as possible on the element. By adding a lumped inductor into a normally distributed L and C environment, the desired results will be obtained even though a step or discontinuity appears in the field pattern.

How can the inductance be increased in the tuner's oscillator when the resonator is a wire or strip of sheet metal? The only way is to cut the resonator at a point closest to the RF ground end. If that can't be done near the ground end, then moving to a location below the midpoint of the resonator will have to do. The result of adding lumped inductance becomes less effective as the L is moved up from the ground end.

To perform the cutting operation, I've used a hobbyist's tool spinning a dental burr. A narrow cut was made in the resonator using the burr, and then a lumped inductor was soldered between the severed ends of the resonator. As a caution, diagonal cutters should be avoided as they can cause severe trauma to the ceramic insulators.

The amount of inductance to add can only be determined experientially. My suggestion is to use a piece of #22–26 buss wire (or a resistor's wire lead) and form a 1/8-inch wide "U," and then solder the ends of the "U" across the resonator's gap. The length of the "U" might be 1/4 of an inch for starters. Measurement of the lowest frequency will be required for each change in the L value. If more inductance is required, then either increase the length of the "U" or try two turns of buss wire formed by winding the wire around an 1/8-inch-diameter mandrel.

Too much added lumped inductance can also "kill" the oscillator, as did excessive capacitive top loading. Increasing the oscillator's feedback may be helpful.

Final comments

The old mechanical variable UHF TV tuners can be used as UHF dippers. Perhaps two or more modified tuners would be required to provide coverage for the potential frequency range of 440–910+ MHz.

With minor modifications, "stock" mechanical tuners can be used as a dipper in the frequency band covering approximately 470–900 MHz. Then, with specific modifications, some tuners may be moved either lower or higher in frequency than that available from the "stock" tuner.

Although packaging had not been discussed regarding the tuner-dipper, the user has complete freedom in completing that aspect of the project. To facilitate the use of the device as a dipper and for convenience, the sense loop may be located over the oscillator wall on the tuner's end opposite the tuning shaft.

Because tuners from different manufacturers vary in design, be ready to experiment and have fun with the tuner-dipper project. The results of the project offer the ham experimenter a very useful tool, and a world of new experiences.

Secret Death Ray

continued from page 17

scientists, is that I found nothing sinister, or even out of the ordinary for that matter. In the end, the site may be more about government research than about some kind of mind control device or apocalyptic doomsday machine. The Web site sponsored by the Navy has good solid information on ionosphere physics, real-time data valuable to hams, and a chance to see how good the current weather is in the interior of Alaska.

You may contact me at [AFDEK1@uaa.alaska.edu] if you have questions or comments. Please be aware that I do not own a tin foil hat.

More information can be found at [http://home.navisoft.com/wes/aliens/haarp.htm] on the patent that caused the fuss. At [http://www.sightings.com/political/weapons/haarp.htm], there's a fringe article on the system as a doomsday box. [http://www.haarp.alaska.edu/haarp/rindex.html] has University of Alaska information on the science performed at the site.

The *Anchorage Daily News* (a local newspaper) has published a large number of articles about HAARP. Use [http://www.adnsearch.com/index.cfm] to search their database for information on HAARP, books about the system, and local letters to the editor.

TV Tutor

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from the transceiver. Serial port interfacing appears to be quite forgiving, particularly with new transceivers that have suitable sound levels on their data sockets on the back. But I hear regularly tales of woe by sound card users. There are complaints of "No picture," which means, the sound level going into the card is way too low, or "noisy picture with excellent signals," which means the level is so high your sound card decodes the noise only. Strong patterning may mean that the transmitter was overdriven with a high level of audio.

There is also the problem of the computer getting into the transceiver and vice versa. I understand that the FCC no longer effectively enforces its regulations regarding computer interference. The most strictly enforced regulations are found in Europe, where not only the output of hash is restricted, but also the susceptibility to it. Computers sold here in New Zealand are better than they were, and laptops may be clean, in fact. But although the European regulations were adopted here, they are not enforced. My own computers and monitors are not completely clean, but I can receive DX SSTV.

Older DOS-based programs (and my RISCOS-based one) may need to receive a complete picture before you can start preparing a picture to be transmitted. The newer Windows-based programs do allow multi-tasking. You see who a picture is from as you receive, and you put a reply text on a picture you choose for your transmission. I am regularly frustrating Italian and Spanish DXers when I choose to wait for the completion of a received picture before composing my reply. SSTV contests are just about impossible without multitasking.

There are several SSTV standards in use, but the ones commonly seen are just two, Scottie and Martin. Their resolution is 320 x 256 picture elements ("pixels"). Both take one or two minutes to transmit. There are modes offering higher resolutions, but their long transmission speeds are only tolerable when you need to get publishable photos from one end of the town to another, on VHF, and on Sunday night.

All SSTV programs have built-in graphic support, for inserting text and pictures and special effects. Some SSTV control screens look like the cockpit on a 747, while others need few controls. There are now so many SSTV programs that I cannot detail them all. Even those that you pay for are so cheap that you can afford to try several.

Please do not circulate paid for programs for free. A popular SSTV program is no longer easily available through ordinary channels, because its full version was put on the Net.

I hope I have not turned you off with all this detail. I suggest you get yourself set up by utilizing the first few paragraphs of this article, and then use the rest as reference once you have an SSTV program on the screen before you.

Why Not Renew On-line?

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be displayed where actually required in the future.

You'll receive a summary submission page after filing. This will have a Submission Identification Number, date of submission, and your callsign on it. Print this out or write down the ID number in case of any problems later, or in case you need to contact the FCC about the filing.

That's all there is to it: A few minutes on-line, and you're covered for another 10 years of exciting hamming. So what kind of turnaround can you expect? Well, after I had filed on-line on June 4th, the effective date on my license came back as June 8th. It was just a short time later (less than 2 weeks) that I received my license in the mail. The license contained a wallet-size copy and a full-size version. Both were printed on one 8-1/2" x 11" sheet ready for cutting and mounting.

I hope this article helps to make an already easy process even easier for you. If you'd like to read more about the new forms available, I think you'll find all these sites helpful:

[http://www.fcc.gov/wtb/amateur/amrenw.html]

[http://www.fcc.gov/formpage.html]

[http://www.arrl.org/fcc/forms.html]

[http://www.fcc.gov/Forms/index.html]

[http://www.fcc.gov/search/wordsearch.html].

A Cold Meal and a Hot Radio

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change my call. That was before the vanity calls were available.

Well, again I was hanging out with Gordon. I was spending more time with him than with my husband. I had just thought I had a dislike for code. In the next few months I formed a distinct hatred for it, but was too stubborn to give up. On my second try, I passed the 20 wpm code test. I don't know who was more surprised, me or my husband.

From the start, one or two of the local hams always wanted to know when I was going to upgrade. Well, they don't ask anymore. I've been tempted to ask the same question, but so far have refrained.

As you can tell, I'm no big fan of the code, but I'm really glad I had to get my licenses the way I did. I had to work really hard, and I think we always value more those things for which we have worked hardest.

As I said at the beginning, I had no idea how amateur radio would change my life. Not only have I had the opportunity to meet people all around the world, but the real blessing has been the friends I have made here in my home town. I have met some of the most wonderful people—whom I would not have met if we had not both had an interest in amateur radio. I count them as my best friends and I can't imagine life without them. I owe that to amateur radio.

Secrets of Transmission Lines

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because this is harder to do, especially with home-brew measurement setups.

In the next section, we will explore what happens between the voltage maxima and minima, and take a look at the origin of and use of the Smith chart.

QRX

continued from page 6

days to cover part of their lodging. They were also given a Hamvention entry ticket making them eligible for all prize drawings as well as a ticket to the grand awards banquet. But in 2000, that will not be the case.

According to information supplied by Forums Chairman Jim Ebner N8JE, the Hamvention 2000 planners have announced that the cash reimbursement will now be made at a rate of one hundred dollars an hour for each hour that a forum runs. But there is a kind of Catch 22. The payment will go only to the forum moderator. No payment will be made to the other participants.

In other words, if there is a session with a dozen speakers that runs two hours, the person listed as moderator or forum leader gets a two hundred dollar payment . He or she then has the option to keep it all or share it with the other participants. DARA says that it will not get involved.

Also gone is the free Hamvention entry ticket and free banquet ticket. Session moderators and their speakers will get badges that will give them entry to the entire Hamvention. If they want to be eligible for the prize drawings, they will have to buy a ticket on their own. Also, if they want to attend the banquet, DARA will sell them a ticket at fifty percent off face value, but the days of free banquet tickets are also now gone.

No reason was given for these changes, but it's believed that the rising cost of putting on a ham radio convention the size of the Hamvention make cutbacks like this inevitable.

Thanks to N8JE and DARA, through Newsline, *Bill Pasternak WA6ITF, editor.*

Number 39 on your Feedback card

THE DIGITAL PORT

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You readers plus hams on the air contribute quite a lot to this column. You would think that a ham who does all this experimenting with the various software and hardware combinations would get more air time than anyone else. Not necessarily so. I feel fortunate to get a little quality communication with some of you.

The other day, I was working some PSK31 and happened upon Gene K5FQ. I had listened to a previous QSO in which he was offering a report on the other station's signal, and I had no way of comprehending how he could do this. Hence, the over-the-air call and the ensuing education.

I was telling him the latest software configuration I was using and he suggested I should visit his Web site and download the version 10 of Logger. Gene explained, with no bashfulness, that the latest version of Logger was absolutely the cat's meow and I think he implied I would be sorry if I didn't get a copy.

Experience: Laptop useful, but ...

I had used Logger previously and wrote about it in the October column. It seemed to work quite well in the laptop, which seems to surprise the programming community, but, if you are as lucky as I am, you too may come upon a combination with your laptop that allows you to work some of these modes portable.

The horsepower isn't there when compared with the desktop, but I can usually run one program at a time with a fair amount of success. Until recently, the two machines shared similar specs except for a little less RAM in the laptop. This led me to believe they were fairly equal.

Then the desktop finally balked, and it was time for upgrades that amounted to a bigger hard drive and more RAM. Also, there was a virus loose in the system. While the desktop was down suffering delays, I attempted to cause the laptop to perform the same as the desktop and it would slow to a crawl for lack of RAM. These were "normal" applications such as a word processor, browser, and mail program all running together.

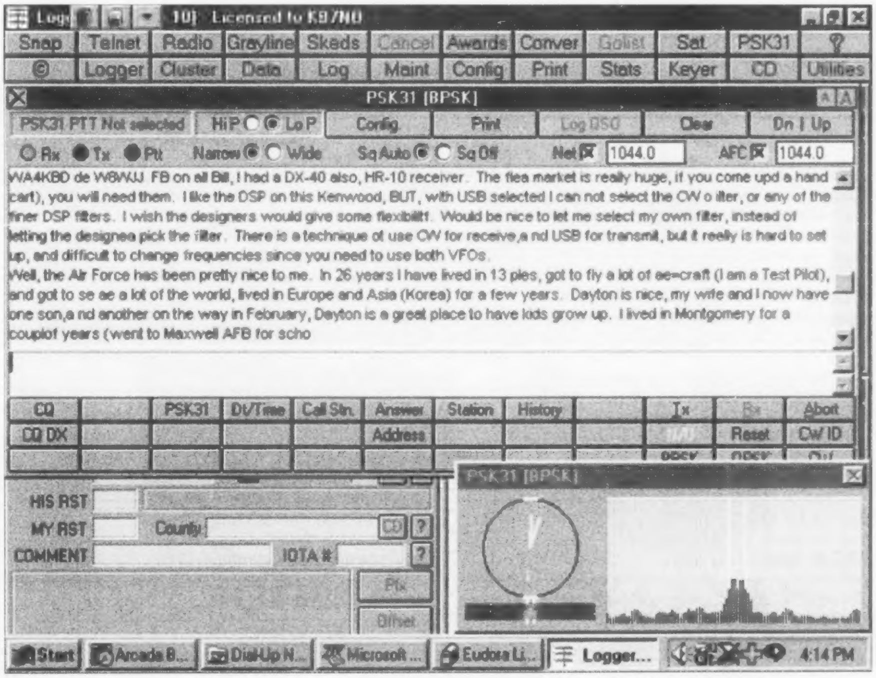
It is nice to have the desktop back running and saving much time. Also, there is a new graphics program that will allow better quality for accompanying pictures. What I am saying is possible encouragement to those who would like to use a laptop that seems a little wimpy. The wimpy laptop at this house has run almost all the ham communication software successfully. Yours may do the same.

Back to the Logger download

Logger is freeware. Most of us appreciate freebies. It is written by Bob Furzer K4CY and is a more complete package than I was aware of. Bob has drawn many favorable comments from users. I went to Gene's Web site and, speaking as a first-time visitor, I can say it is a pleasant surprise. He claims 4,000 links to ham-related topics and has some very interesting ham links on the home page in addition to PSK31 stuff. If you are like me, you will find it irresistible to follow some of them.

The site is [www.mysite.com/k5fq/]. I made a common error when I entered the address the first time. I found by capitalizing the call letters, it didn't work. It went somewhere unrelated and I was a bit dismayed about how to rectify the problem until I tried the lower case k5fq. Just wanted you to know.

There is a link to a screenshot of Logger on the Web site. You should take a look at that as well as the one here in the article. They are different because Logger is, as it implies, a logging program. We all need one of those. My paper logbooks are in



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WA4KBD de W8WJJ  FB on all Bill, I had a DX-40 also, HR-10 receiver.  The flea market is really huge, if you come upd a hand
cart), you will need them.  I like the DSP on this Kenwood, BUT, with USB selected I can not select the CW o ilter, or any of the
finer DSP filters.  I wish the designers would give some flexibilt!  Would be nice to let me select my own filter, instead of
letting the designea pick the filter.  There is a technique of use CW for receive,a nd USB for transmit, but it really is hard to set
up, and difficult to change frequencies since you need to use both VFOs.
Well, the Air Force has been pretty nice to me.  In 26 years I have lived in 13 ples, got to fly a lot of ae=craft (I am a Test Pilot),
and got to se ae a lot of the world, lived in Europe and Asia (Korea) for a few years.  Dayton is nice, my wife and I now have
one son,a nd another on the way in February, Dayton is a great place to have kids grow up.  I lived in Montgomery for a
couplof years (went to Maxwell AFB for scho
```

Fig. 1. Screenshot. Here is the Logger program configured to work PSK31. There are portions of four windows displayed. At the very top is a small strip of the basic control screen. Below that is the PSK31 screen with some controls and indicators above the receive screen. Since I was only "reading the mail," there is nothing in the transmit screen. Below the blank tx area are programmable buttons, along with some other standard controls. When you switch to other operating modes such as RTTY or Pactor, there are other sets of programmable buttons. The lower left is the partially hidden entry screen for the logging portion of the program. At the right is the highly effective tuning indicator that includes those elements described in the text and the spectrum analyzer. These windows can be placed where you choose for operating convenience.

disarray and this part of the program is a welcome addition to the shack.

On the Logger site, there are options for first-time users and upgrades. Plus, there are some other helpful files you may need. Plenty of information to get you going.

If you like documentation, you can get all you want. I printed the manual, which turns out to be the help file as well. It comes up in RTF format. I think that imports into most word processors. It displayed 184 pages, and just about all of them are full of information. A few are merely title pages where something will likely be added, but if I had edited those down to size, there would still be a good 160 pages.

The only thing lacking is an index, and if you use the help file in the program, you will have an automatic index with hyperlinks. There are enough bold titles, however, so that you can spot subjects you are searching for. And ... as I thought about it, if this were written by a major software tech writer, it would be expanded to over 500 pages easily. What is written is concise. I did a little extra step before printing. My copy has page numbers now. Hate to drop those bundles of paper when they aren't numbered.

There are instructions on the Web site for installation, just to keep us out of trouble. When I went to do the installation, I realized I had never run the old copy on this computer. I had only done the complete installation on the laptop. I must need more RAM somewhere in this cranium. So ... simple enough ... I had to do that installation first, then begin the procedure of installing the upgrade.

These installations went flawlessly. There are some notes with the software to let you know of the minor abnormalities you will experience during the install, along with the reasons for those hiccups. Keeps you from panicking.

The first thing I wanted to see was the PSK31 mode with its associated windows. The PSK31 is simple enough. You will definitely want to configure the system before you go this far, but that is simple enough. It is slightly more complicated than entering your callsign. If you are new to PSK31, Gene's Web page has links to all the information for radio-to-computer interface.

After configuration, the PSK31 screen will, after clicking the button, display, and you will then need to arrange the windows on the screen for best viewing and accessibility to the various buttons displayed. The screenshot is only one configuration. You will move these windows around several times before you have the "ideal" placement.

Current Web Addresses	
Source for:	**Web address (URL)**
HF serial modem plans + software	http://www.accessone.com/~tmayhan/
SV2AGW free Win95 programs	http://www.forthnet.gr/sv2agw/
BayCom — German site	http://www.baycom.de/
Pasokon SSTV programs & hardware	http://www.ultranet.com/~sstv/lite.html
PSK31 — Free — orig. PSK31 — also Logger	http://aintel.bi.ehu.es/psk31.html
Site with links to PSK31 and Logger 10	www.mysite.com/k5fq
PSKGNR — New — Front end for PSK31	www.al-williams.com/wd5gnr/pskgnr.htm
Baycom 1.5 and Manual.zip in English	http://www.cs.wvu.edu/~acm/gopher/Software /baycom/
Source for BayPac BP-2M	http://www.tigertronics.com/
TNC to radio wiring help	http://freeweb.pdq.net/medcalf/ztx/
ChromaPIX & ChromaSound DSP software	http://www.siliconpixels.com/
Timewave DSP & AEA products	http://www.timewave.com
International Visual Communication Association — a non-profit organization dedicated to SSTV	http://www.mindspring.com/~sstv/
XPWare — TNC software with sample download	http://www.goodnet.com/~gjohnson/
Auto tuner and other kits	http://www.ldgelectronics.com
TAPR — lots of info	www.tapr.org
Creative Services Software	www.cssincorp.com

Table 1. *The infamous chart. "Almost everything ..."*

In the case of having used the local radio and computer for this mode, it was simple to get the sound levels adjusted. With the IC-735, I have cables running from the accessory port on the rear of the radio to the line-in and line-out on the sound card, and that is all the hookup I use. Then I adjust the sound levels with the audio sound panel in Windows95 to the levels suggested in the documentation.

I have not yet built the necessary interface for PTT. With a little concentration, I turn around quickly enough to satisfy most situations. I may just do that as a next project. Sometimes my concentration ebbs.

The documentation leads you to building an interface to use the mike connector on the radio. That evidently works for everybody, and they don't confuse the issue by telling you that some radios don't need this interface. Perhaps there is info on my hookup somewhere within the hundred or so pages I haven't committed to memory as yet. In any case, sound level is critical, both on transmit and receive.

You will get the most comments if you are overdriving the sound card. The little horizontal field just below the round tuning indicator in the screenshot is called the "waterfall." When the incoming signal is tuned properly, it should display a fairly narrow white waterfall (for want of a better description). If it is wider than what you will soon recognize as normal, the transmitted signal from the other station is not adjusted properly. This leads to interference with other signals.

Just today, I was observing signals on the air and noticed two clean signals with approximately the same amplitude within 40 Hz of each other, and they could each be tuned in and copied very well. Try that in other modes. CW is the only other mode I have seen that would compare.

Now, here is the trick part of the program I wanted to see. I mentioned I had listened to

Gene giving these unusual sounding reports on intermodulation and supplying numbers as well. You too can experience indicators. If you look in the screenshot at the rectangle to the right of the round tuning indicator and waterfall, you will see a spectrum analyzer.

This little screen is marked horizontally with 50 Hz increments, so it is 250 Hz wide. When you tune a signal to the middle of this rectangle, there are two red vertical lines that turn yellow. When yellow, the signal can be decoded and received text displays on the screen. If the transmitting station is not sending text (and only then — much like a RTTY diddle), there is a display of numbers indicating intermodulation. There is an explanation of what this indicates in the manual. It is enlightening.

The most useful part of the tuning indicator, at least at first, is within this rectangle, as it enables simple, quick, and accurate tuning of the incoming signal. After some practice, you will find you could tune without the spectrum analyzer, but as long as it is available, you will always use it. You will get used to where the signal is and how much to turn your tuning knob (slowly) to get there. These are narrow signals at 31 Hz, and you can go by them before you know they are there.

One other thing I learned

I was watching a QSO in which one of the signals was definitely overdriven. The operator was attempting the usual audio adjustments with no success. Then came the revelation that his compressor was on. There are warnings not to have the compressor on, but that was a good example of the reason why, and now, to me, it is recognizable. The waterfall seemed to resemble a cowcatcher on an old steam engine. Another signal might look different, but this one pattern was unique.

Accessing the log file

There is more to the program. I have only touched on a little bit. An important part of the logging program may fly right by during the initial setup. That is that the program creates a log file for you the first time you run it. That log file is titled with your callsign. On the opening screen, if you want the log available to make entries, you must click on your callsign in the little window that presents itself. You will find in the configuration process that there is a way to cause this to happen automatically on boot-up.

Now, I must confess, I am overwhelmed with the many features of Logger. I have only touched on the surface and realize that the hundred or so pages hold many surprises. To give you an idea of what is there, I will just tell you of an enthusiastic reader's comments.

I received an E-mail from Joey N9LQ the other day. He is using the PTC-II TNC and is an avid digital operator. He told me how he downloaded the free Logger program and started using it on all modes — and liked it so well that he has now deleted the commercial all-mode software he was using and just uses Logger.

I have another pending project. I looked through the program to find a configuration to address my old PK-232MBX. It is often a stranger to new programs. I will have to find the combination that works. Once I do, it looks like the program should be as effective as any other for all the modes supported by the 232.

Joey went on to tell of building the Lectrokit PSKI interface and how well it made his set-up work. Then he told of an "Enhanced Mixer" he down

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"Enhanced Mixer" he loaded from [www.modemss.brisnet.org.au/~mlevoi]. I haven't done this as yet, but he claims he can make custom audio level settings for each band and call them up when he changes bands.

I will have to investigate this and let you know. I do notice a difference in audio settings between the voltage available when operating from battery power as opposed to the shack power supply. This requires audio level compensation. I find that the quickest way to the control panel in Windows95 is with a right click on the sound level icon at the bottom of the screen. However, there seem to be different versions of Windows and that may not work for all.

Another recent addition is a CD-ROM disk from QRZ. This arrived when only the laptop was available. On installation in the laptop, access to the disk through the Windows overlay was agonizingly slow. Then I found the DOS interface and the speed was reasonable. When installed in the desktop, it is blindingly fast. Sometimes it seems instantaneous when being accessed through a communications program such as Logger. I tried it with several programs. (Why did I not have one of these before?)

If you have questions or comments about this column, E-mail me at [jheller@sierra.net]. For now, 73, Jack KB7NO.

Number 42 on your Feedback card

ON THE GO

Mobile, Portable and Emergency Operation

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Hurricane encore

With this being the December issue, I had originally planned on writing my Christmas wish list and telling my YF that since it was published, she would need to make sure that all the items were given serious consideration. Unfortunately (or fortunately?), this plan was overcome by events.

I'm writing this in mid-October, and although hurricane season doesn't officially end for another six weeks, most of us are more focused on fall activities such as shifting from "Back to School" to Halloween. Tropical storms are not in the forefront. Hurricane Irene was one of those storms that developed in the Caribbean Sea and moved toward the west coast of Florida. While the computer models for hurricanes that develop in the Atlantic are very impressive, those for storms in the Gulf or the Caribbean are less accurate. I guess with all the islands it is like projecting the path of a pinball. In any case, the lack of solid projections reminded me of SkyWarn during tornado season up in the Midwest: Just when you think something is going to happen soon, but there is no idea as to exactly where or when.

The National Weather Service asked us to bring up the SkyWarn net about 10:00 p.m. on Friday. Naturally, it is difficult (if not impossible) to do much storm spotting in the dark, but since flooding was the main concern, there was some good the ham community could do. The net was on the air until about 2:00 a.m., when everybody pretty much folded up — one of the hazards of having a disaster on a Friday night after a full week of work. The spirits were willing, but the flesh kind of wore out after a while.

Much of the heaviest weather hit during the early morning hours, with high winds and torrential rains. The next morning, the net came back up bright and early, and I rejoined it around 9:00 a.m. We were operating both SkyWarn and the emergency services nets concurrently on the same frequency. There was not a lot of traffic, but enough to keep me busy as net control. Although I have often acted as net control, I had a couple of surprises which I wish to share. As most jokes go, I'll give you the bad news first.

The night before the storm, when the weekly emergency net was scheduled, net control did not come up on the frequency at the appointed time. Since we rotate the net control duty, this happens occasionally, since even hams have unexpected commitments due to work, family, etc. Several stations called to ask if the net was going to be held but no one actually started it. I established the net and wondered why there were so few hams who were interested in taking net control duty.

The following few days during the Hurricane, I noticed a few examples of poor operation that did not seem to be in the true spirit of amateur radio. At that point, several impressions struck me. First, I know of people who have been excellent net control operators who no longer participate in that capacity. I suspect that some of them got tired of some of the hassles that can go with net control duty. Others who might be interested may be a little intimidated by the thought of trying to be net control; when they hear some of the inappropriate comments made on a net, this interest may be lessened. Here are some things to remember when part of a network in any capacity.

First, few if any of the participants on the net do this full-time. Everyone is a volunteer using skills normally associated with a hobby. These are skills that in an emergency are pressed into heavy-duty service, and it takes even a skilled operator some time to get into the rhythm.

Second, if this is a real emergency, the adrenaline is going to hamper everyone's ability to stay cool. Unfortunately, in a real emergency people can get injured or killed, and even the prospect of such an event can cause people to stammer or falter just a little. It's easy to chat on the way to work or rag-chew on the low bands. Handling traffic that may affect people's lives or homes takes a little more out of all of us.

Third, net control is often trying to handle multiple tasks at any given moment. It is common to be monitoring multiple frequencies — the frequency on which this particular net is operating, perhaps a frequency used for county wide command and control, a link to other counties or agencies, etc. If located at a government agency, there will be at least one public service frequency being monitored. Add to this the need to pass traffic received by telephone to the appropriate served agencies or handle face-to-face discussions with public service or emergency agency people, and things can get hectic.

Also, when a ham picks up the mike to handle a net, he or she does not forget about the health and safety of his or her own family. What you hear on a given frequency is only a small part of the activity that is occurring, so if net control occasionally seems distracted, he probably is.

Fourth, an emergency you report to the network may not be perceived as critically as you think it should be. During Hurricane Irene, a number of good-sized pleasure craft broke loose and were adrift and headed toward a bridge. These were duly reported through the net to the appropriate authorities. Because of far more pressing issues, these were summarily placed well down the list by the responsible

Number 43 on your Feedback card

ABOVE & BEYOND

VHF and Above Operation

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Microwave Update 1999

Just came back to San Diego from one of the best Microwave Update 1999 conferences that has ever covered amateur operations from 1 GHz to over 47 GHz and into light frequencies. The conference was held at the Harvey Hotel in Plano, Texas, on October 21st through October 24th. This fine conference was hosted by the North Texas Microwave Society and their members who, with the ARRL, were able to bring together amateurs from all over the world with one common interest, microwave communications.

The entire conference was directed to the premise of sharing technical knowledge and current developments through the microwave spectrum of our amateur frequency bands. For those that have never been to a microwave update conference, it is a semi-informal event sponsored and dedicated to amateur endeavors. Events scheduled include many speakers presenting papers and talks covering phase noise, microwave rover operations, 1296 VLNA computer design, laser communications, amplifiers, feedhorn designs, systems for 120 and 145 GHz, synthesizers, rain scatter, EME, new transceivers, loop yagis, TWTs, and AMSAT updates. And that only describes a portion of all the events that were cram-packed into four days of talks, swap meets, great Texas BBQs, technical noise figure and spectrum analyzer workshops, and an antenna workshop for feedhorn measurements and antenna gain measurements.

There were amateurs there from all parts of the globe, including Japan, New Zealand, Germany, England, and many more. All in all, it was a very successful conference, and the free forum and exchange of ideas and applications helped to bolster our continuing support of microwave interest to help promote usage of these very interesting frontiers.

While there were many very high end microwave systems operating into new frontiers above 24 GHz, there were also systems that were quite simple in operation, making a great blend of systems for everyone from the beginner to the experienced microwave amateur. For those that could not be there, a book of the entire proceedings was published by the ARRL that covers all the papers presented at the Microwave Update 1999 Conference. It's available from the ARRL as their #7725 (ISBN: 0-87259-772-5). I understand the cost is about $15. This book covers quite a bit of information and is about the size of an *ARRL Handbook*, with 620 pages of papers submitted by microwave amateurs covering a wide range of interests.

Let me take you on a short tour. We arrived at the Harvey Hotel on Thursday, the 21st, at about 4 p.m. in the afternoon. Due to our travel arrangements and time constraints, we had to miss the early program, which was a tour of the surplus dealers in the Dallas, Texas, general area that was conducted with the able help of Kent Britain WA5VJB.

We took a short tour of the hotel and met several old friends we had only communicated with before via E-mail or other methods before this great eyeball QSO. Settling in and a great supper got us ready for the conference proper and the opening session Friday morning, conducted by Al Ward W5LUA. Speakers were presenting topics all day long on a very large variety of topics. Additionally, in the afternoon, after the noon lunch break, a secondary event was held in the hall outside the meeting room. All amateurs were invited to drop off RF preamps, synthesizers, and other microwave networks for evaluation in the Noise Figure/Spectrum Analyzer/Network Analyzer/Phase Noise Test Equipment workshop.

I dropped off three items for evaluation, as did many others. The items I submitted for evaluation were a 10 GHz bandsawed Qualcomm 3-stage RF preamp, and 2 synthesizers, one for 2592 MHz, and one for 1152 MHz. The synthesizers were to be

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public service agency. This is their job — they do it every day — and such decisions definitely belong to them.

Okay, those are the suggestions to improve our operating habits. The good news? At least 99% of the practices I encountered during the hurricane were outstanding. Many hams monitored and stood by ready to assist or pass traffic. Periodically, when things had quieted down, we would request a check-in. The first time I did, I was shocked to find over 50 stations available and on frequency. There was very little unnecessary communication; these folks just stood by until needed and then helped where they could.

I've always been just a little biased, and felt hams were special people with special skills. After last weekend, I'm sure there is no bias — it's just fact. Thanks to one and all.

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evaluated for phase noise and the preamp for gain and noise figure. I knew ahead of time that the synthesizers were reasonably good, being some 50 dB down in phase noise products, but the preamp was a lark.

The preamp submitted was a surplus Qualcomm 3-stage commercial unit normally set to operate at 12 GHz. I bandsawed the metal housing with the preamp attached and had to convert it with two SMA connectors and two 1 pF chip caps between the circuit board traces and the coax connectors. DC power and -5 volt bias test leads were attached, and the unit was sealed in aluminum tape for shielding; this was all that was done. NO TEST OF OPERATION WAS PERFORMED — I wanted an evaluation of the pre amp "OUT OF THE CHUTE." Somewhat dangerous should the amp not function; however, it measured at 10368 MHz 26.4 dB gain, and a noise figure of 2.13 dB. Not bad for an untested commercial 12 GHz Qualcomm preamp obtained in surplus and operated on an amateur frequency. The phase noise of the synthesizers measured to just over 70 dB down, some 20 dB better than my simple test equipment could determine.

I don't have the figures on other devices submitted at this time, but there were 30 to 40 devices submitted for evaluation, making this event and service graciously conducted by the North Texas Microwave Society quite popular. Not only did they put on a great day of speakers on microwave, but they also conducted a very helpful workshop using some of the most sophisticated test evaluation equipment for microwave ever assembled at any one point for amateur use.

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After this great schedule of events, an after-supper flea market and general bull session were conducted in the main conference room. I have to admit I have never seen so much microwave material assembled in any one place at any one time. The material offered for sale was so varied and covered many amateur bands up to about 40 to 50 GHz. Something for everyone. I have assembled material over many years of scrounging, but what I observed in this one room made my stuff look pale in comparison to the material offered for sale.

Saturday was a similar day that started off with the San Diego Microwave Group's presentations on synthesizers, a simple 2 GHz "Synplexer" presented by Ed Munn W6OYJ, and a 10 GHz transverter presented by Kerry Banke N6IZW. Later, the same workshop forum was held again for amplifiers, preamps, and such as was held on Friday. The evening program was a BBQ banquet for all. The main speaker was Joel Harrison W5ZN, Vice President of the ARRL, who put on a very humorous presentation spoofing protection and saving of a protected species, the "ARMADILLO," which suffered a sudden road-related tragedy. Joel brought the house to its knees.

After supper, a Texas two-meat BBQ of beef and chicken, there was an auction followed by a prize drawing for those in attendance at the banquet. This was a most unusual after-banquet drawing in that there were items for all. Not only were there prizes drawn at random pulled from a hat, there were enough prizes to offer a chance for every one in the banquet room to receive his choice of items on a table of prizes. A great idea, something for everyone. Not one person went away empty-handed — what a conference!

As the conference wound down, there were still events scheduled for those that could stay for the Sunday morning antenna measurement and dish feed test range. Needless to say, this required a large area in which to conduct antenna measurements tests. It was held in a back parking lot of the Harvey Hotel. Systems tested covered all aspects of operation, from 1 GHz to a system that functioned at 47 GHz.

Our San Diego Microwave Group tested a simple system called the "Synplexer," a play on words of Polaplexer and Gunnplexer combined with a Synthesizer for local oscillator injection. In its simplest form, it requires a coffee can antenna with 1/4 wave receive and transmit probes offset by 90 degrees. Coupled to this system was a modified synthesizer operation at 2302 MHz and receiving at a 146 MHz IF frequency. That means that the other system in use had to operate at 2448 MHz transmit and receive at its IF "146 MHz" for 2303 MHz. The 10 MHz oscillator providing clock to the synthesizer was modified to accept a small audio amp driving a varactor inside the 10 MHz tcxo oscillator for FM modulation on each end. The receive system at each end was a modified TVRO LNA for RF preamp use driving a single diode detector and connection at each end to a 2 meter HT for receive at 146 MHz, the IF frequency for full duplex voice communications.

This system was put together from flea market LNAs and other surplus materials to show that a simple system that has good communications range can be constructed for very little cost. In tests, the coffee can antennas could feed dishes but were used as the main antenna by themselves and showed about 6 dB gain. For communications in the 1/2 mile range, the antennas did not need to be pointed at anything in particular for good communications. Ed Munn W6OYJ and Kerry N6IZW demonstrated the system during the parking lot antenna measurements workshop. That's where Ed was able to make

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HAMSATS

Amateur Radio Via Satellites

Andy MacAllister W5ACM
14714 Knights Way Drive
Houston TX 77083-5640

Keeping up with changes in the world of amateur-radio satellites is a challenge. Long gone are the days of only one functional hamsat in the sky. Today there are over a dozen, and they vary dramatically in their operation, frequency usage, and orbit. The AMSAT General Meeting and Space Symposium has been a great source of information about what's happening now, and planned for the future.

The AMSAT Symposium

Duane Nagle KO6BT and his crew in San Diego hosted AMSAT's 17th Annual Meeting and Space Symposium. It was the best yet. AMSAT events got started early on Friday, October 8th. After a short introductory "welcome" from Duane and appropriate thanks to Kenwood and Qualcomm for their support of this year's event, AMSAT president Keith Baker KB1SF made an announcement.

Keith got things going with the long-awaited announcement that Dr. Karl Meinzer has signed a contract with Arianespace (Tuesday, October 5, 1999). P3D will be on the first suitable *Ariane 5* launch as a secondary payload. Specific details were not made available in the press release of October 7th, but this is the major milestone that satellite enthusiasts have been waiting for. While it is possible that P3D may go to orbit as early as April, 2000, the wait for a ride could be longer. In the meantime, P3D will be shipped to Kourou, French Guyana, by the end of October. The satellite will then be checked out and stored as a "standby" passenger, ready to go to orbit.

Ken Ernandes N2WWD began the symposium presentations with a talk about the Apogee at Constant time-of-day Equatorial (ACE) Orbit for amateur radio satellites. Ken discussed the mechanics and advantages of this type of orbit for easy ground-station tracking.

AMSAT
Keeping Amateur Radio in Sp

Photo A. The AMSAT 17th Annual Meeting and Space Symposium was held in early October at the Hanalei Hotel in San Diego, California.

Kerry Banke N6IZW gave details on methods for modifying Qualcomm OmniTRACS surplus microwave equipment for use with amateur satellites. Kerry has been working with the gear mostly for terrestrial use, but the advantage of inexpensive high-quality surplus modifiable microwave equipment provides highly cost-effective units for possible hamsat work.

Kerry's talk was a good mix of understandable hardware modifications using some very advanced electronic microwave building blocks like synthesizers, reference oscillator modules, gain measurements on the coffee can antenna used in this system.

There were far too many different aspects that need to be further discussed and articles that need to be written covering the many aspects and developments put on display here at Microwave Update 1999 in Plano, Texas. Many great eyeball QSOs were made, and old friendships renewed. All in all, it was a great happening that I was very proud to have been a part of. One has to salute the great effort put on by the North Texas Microwave Society and the great contributions of its members for their efforts in pulling off such a great conference with such professional excellence.

The next Microwave Update will be held in the Philadelphia area, with John Sorter KB3XG and Paul Drexler W2PED hosting next year's event. You should give serious consideration to attending.

Well, that's it for this month. All in all, it was a great trip and lots of fun. I recommend that you obtain a copy of the proceedings being made available from the ARRL. It's a wealth of information that you should consider obtaining. Best 73, Chuck WB6IGP.

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mixers, and other items. The symposium proceedings give complete procedures for using the Qualcomm units on ham bands from 1.2 GHz up through 24 GHz. These are not good projects for novice-level kit builders, but it's getting cheaper and easier to get on the more esoteric microwave ham bands.

Dr. Bob Twiggs KE6QMD of Stanford came to tell us about OPAL, the Orbiting Picosat Autonomous Launcher. The program began in 1995 to build and launch a satellite that would act as the "mother ship" for a group of very small satellites called picosats (1 to 2 kg weight) to be ejected from "launcher tubes" after OPAL is in orbit. The rocket is a modified Minuteman missile.

Artemis is a group of female engineering students at Santa Clara University. They have built two picosats that are used to study VLF signal characteristics from orbit. They hope to differentiate between horizontal and vertical VLF signals generated by lightning storms from orbit. A third picosat was also built by the group.

STENSat was a result of Bob Twiggs' challenge to the attendees at the 1998 AMSAT Symposium in Vicksburg, Mississippi, to propose and build a picosat. Bob showed the symposium attendees a complete engineering model built by the STENSat crew. This Mode "J" (two meters up and 70 cm down) FM transponder-in-the-sky is small enough to fit in your back pocket. Bob demonstrated the antenna deployment system that unfurls the dipoles for the VHF receiver and the UHF transmitter.

A third group of picosat builders from the Aerospace Corp. have built two tethered satellites as a wireless radio communications demonstration.

Bdale Garbee N3EUA made a presentation about why AMSAT software should be freeware. This is a controversial issue, but Bdale used some historical background about how freeware via the Internet has actually helped AMSAT get more enthusiasts into the hobby. Bdale has been involved with many AMSAT projects and acknowledges the fact that much of AMSAT's income has been derived from satellite tracking software sales. Bdale pointed out that "open source" (almost free) software provides a means for the software to evolve by inviting users to become participants in the software development process and conversion for use in other operating systems. Bdale also pointed out that software that can freely evolve to provide features that have not yet been identified is software that will endure.

Assi Friedman KK7KX presented updates on the status of ASUSat1 and the upcoming launch with JAWSat, OPAL, and FalconSat. In addition to its digital communications system, ASUSat1 has a single-channel FM voice transponder. The Arizona State University efforts go beyond this, their first amateur satellite. More satellites are on the way for launch in 2001 and 2002, and testing efforts continue with small "CANSats" that are sent up on non-orbiting amateur rockets to test new systems designed and built by students. Assi was joined by Brian Underhill and others to provide details about the multitude of projects currently in production or design. Conference attendees were delighted with a video clip of a recent CANSat launch from Blackrock, Nevada.

Andrew Taylor KC0BPD is a senior at Colorado State University working on an electrical engineering degree. His presentation focused on the use of digital point-to-point protocol (PPP) communications for the Citizen Explorer Satellite project. Andrew pointed out that PPP is simple and inexpensive to implement. The Citizen Explorer satellite will be accessed via a ground stations in Colorado, New Mexico, and Alaska. Compared to the AX.25 data format commonly used by hams for packet radio, the PPP protocol uses fewer packets and fewer overhead bits to get the data through. The satellite is an educational project designed to provide satellite measurements of local ozone and ultraviolet radiation for a worldwide student audience.

Cliff Buttschardt K7RR presented some simple yet effective methods of building 70-cm patch antennas on a budget.

Photo B. *The weather was perfect, as were the facilities.*

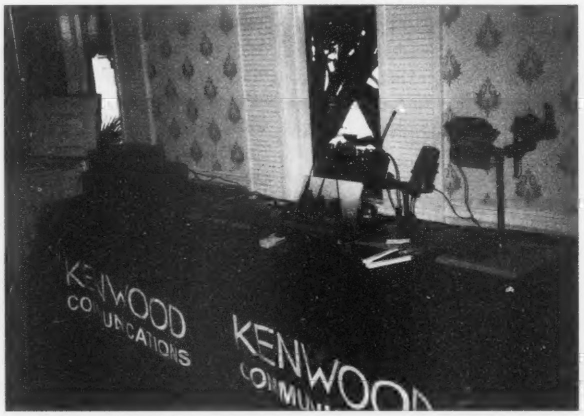

Photo C. *Kenwood had two representatives and a nice display of new radios at the Space Symposium.*

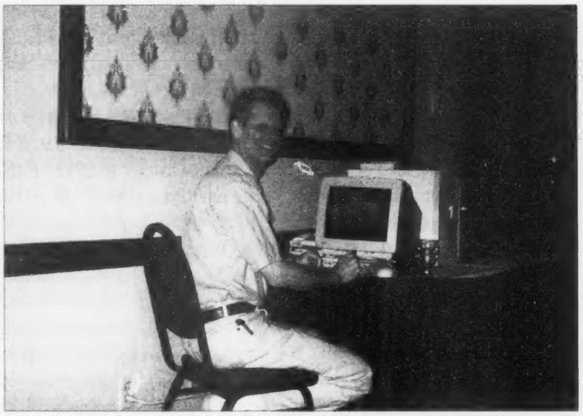
Photo D. *Bruce Paige KK5DO set up in the symposium meeting room to feed live audio via geosat and record the talks for Internet distribution from [http://www.amsatnet.com].*

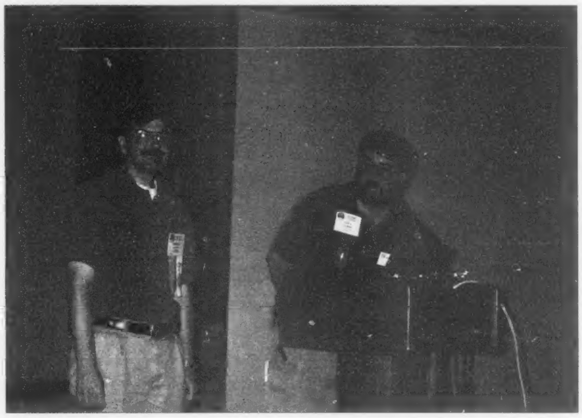

Photo E. *Frank Bauer KA3HDO and Will Marchant KC6ROL provided updates on amateur radio systems designed for the International Space Station (ISS).*

Cliff began with background information on how patch antennas work and how to make them with circular polarization. The materials Cliff used were surplus road signs that are typically made from .060" aluminum-alloy sheets. Circular polarization is achieved by orienting the feed point at a specific spot on the patch. While one spot creates right-hand circular polarization (RHCP), a point on the opposite side of the patch will create a left-hand circular polarization (LHCP) orientation. To have a switchable-mode antenna, the two points for RHCP and LHCP are fed by coax to a simple RF relay. Cliff's paper in the symposium proceedings gives complete details on the methods and materials to use to make successful patch antennas.

Photo F. *Matjaz Vidmar S53MV came from Slovenia to present his interesting findings on "No-Tune Transceivers for the Microwave Bands."*

Photo G. *Bob Bruninga WB4APR (APRS inventor) demonstrated portable 9600-baud digisat reception in the parking lot outside the symposium meeting room.*

Randy Kohlwey N7SFI provided an update on the status of JAWSat, which at the time of the conference was at Vandenberg waiting for launch. Randy's talk began with a brief history of the Center for AeroSpace Technology (CAST) and its mission. JAWSat's goals include providing a physical platform for other satellites, e.g., OPAL, FalconSat and ASUSat, and to carry six video cameras with transmitter system, some scientific experiments, and an amateur-radio store-and-forward communications payload. The cameras are set to monitor the separation of the sub-satellites after orbital injection.

Anthony Monteiro AA2TX has developed a new software offering called Instant Tune for the Yaesu FT-847. Tony recognized an opportunity to create an automatic tuning system that would take care of Doppler adjustments during a satellite pass. Instant Tune works in conjunction with Instant Track satellite tracking software. Instant Tune will calculate the necessary corrections to both the transmit and receive frequencies during a satellite pass. The software will then apply these corrections directly to the radio through its computer connection port.

Originally the software was developed for the Kenwood CAT system. From there it was modified to support a multitude of radios and the various hardware interface restrictions. With the introduction of the FT-847 from Yaesu, Anthony targeted this new radio with his recent efforts. With Instant Tune running, the user simply sets his radio for the appropriate receive frequency and operates. Doppler shift is automatically addressed and satellite conversations become as easy as HF (shortwave) operation. Anthony did a live demonstration of his

Continued on page 50

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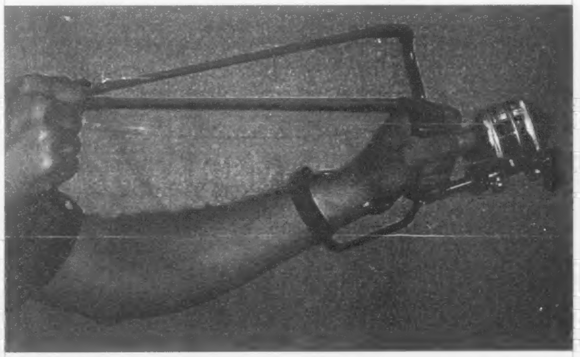

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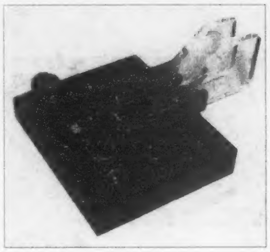

Vibroplex Code Warrior Jr.

Now that the Cold War is over, Vibroplex has brought out the Code Warrior Jr., the production version of the Norcal K8FF key. As they say, for the "fist" time in their history, Vplex is offering QRP keys, and this one is destined to become a collectible.

Each Junior is uniquely serial numbered and dated, with black powder-coated bases, clear paddles, magnetic action, and NO springs. For price and other info, contact The Vibroplex Co., Inc.; 11 Midtown Park, E.; Mobile AL 36606-4141. Call (334) 478-8873 or fax (334) 476-0465.

Sun Visor Mike

These days ham radio is a hobby on the go. The advent of small, affordable mobile radios has allowed every amateur radio operator to take his hobby "on the road" with him. Still, one thing always gets in the way: the microphone.

It seems like the microphone is always either in the way or just out of reach. When you are driving down the road, it's not only annoying to have to dig around on the floor, mid-QSO, for the mike you just dropped, but it's also dangerous.

The PRYME MMC-100 "Sun Visor" microphone brings an end to all that. The MMC-100 is a unidirectional clear-sounding electret microphone mounted on a flexible gooseneck. It secures to the sun visor of your car, so it's always in place for all your ham radio mobiling. The Push-To-Talk switch for the microphone is located on an in-line box that can be mounted to the gear shift or arm rest, making mobile operation more convenient and safe than ever.

The MMC-100 is sold without a microphone cable. However, six different optional microphone cables are available to support all of today's popular HF and VHF/UHF base station and mobile radios. Just purchase whichever cable you need for your radio or radios. The cables are strictly plug and play; no soldering is required.

For more information about the PRYME MMC-100, contact Premier Communications Corp., 480 Apollo St., #E, Brea CA 92821; tel. (714) 257-0300; Fax (714) 257-0600; E-mail [premier@adi-radio.com]; site [www.adi-radio.com].

Free Software

HAMCALC version 40 has now been released by George Murphy VE3ERP. With many new upgrades, it includes over 200 painless math and design programs for radio amateurs and professionals alike. HAMCALC has been used worldwide as a reference and learning tool since its introduction in 1993. All programs have the option of working in either metric or imperial units of measure, and you'll find much information not readily available in current handbooks and literature.

HAMCALC is written in GWBASIC and requires a GWBASIC.EXE file in your root directory. For a free HAMCALC 40 3-1/2" MSDOS/Windows diskette, send US$5.00 for airmail shipping/handling anywhere in the world (US$6.00 for GWBASIC also) to George Murphy VE3ERP, 77 McKenzie St., Orillia ON L3V 6A6, Canada. E-mail George at [ve3erp@encode.com].

NEVER SAY DIE

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Guide to Wisdom, which reviews most of the above books.

Until you honestly try the procedure I've outlined, you won't know if or how much it could change your life. The body, given the right nutrients, and a positive attitude, is capable of incredible healing powers. Or would you rather keep suffering with a backache, arthritis, or whatever? My *Secret Guide to Health* explains how you can best care for your body, thus giving it an opportunity to repair itself. Now all you need to add is a positive attitude (known also as prayer). Please try this simple experiment for 60 days and let me know what happens. If the results are as spectacular as I expect. I'll need your help to get on the Tonight show.

Prayer really does work — just not the way most people think. I'll tell you what — maybe you'll take a half minute out of your day to help me? I would appreciate your prayer for me to help make my body healthier and younger, so I'll have more time to get the word to anyone who will listen. If coffee ice cream starts looking less attractive to me I'll know your prayers have helped.

Everything fits together so neatly that I'm very excited about this — but I'm depending on you to prove I'm right.

Bioprogress

I really appreciated getting a letter the other day from a 75-year-old reader who credited the bioelectrifier with completely curing her cancer. Her doctor couldn't believe the x-rays! But this was followed up by a call from another reader who owns four hospitals and who has

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CIRCLE 141 ON READER SERVICE CARD

Photo H. *Danny VA3JDH used a hand-held Arrow antenna to make voice contacts through SUNSAT-OSCAR-35 during a break in the talks.*

HAMSATS

continued from page 47

system. It worked, even in front of a large audience. The software (and source code) are free and available from the AMSAT Internet site [http://www.amsat.org].

Dr. Paul Shuch N6TX ended the official day's talks with his "Anatomy of a SETI Hoax." Paul described some of the many inconsistencies that surfaced after various details surrounding a purported SETI (Search for Extraterrestrial Life) signal reception in late 1998. While Paul's talk covered a serious topic, his capability as a popular speaker brought some fun and humor to the presentation. Many individuals and groups around the world gave credence to the hoax until the details became public knowledge. Paul finished with a new folk song he wrote for the AMSAT gathering: "A Memorial to *MIR*."

Friday activities continued into the evening with two parallel sessions. One was a beginner's forum hosted by Gould Smith WA4SXM, with explanations of issues that confront new hamsat operators. Gould, with help from other long-time satellite enthusiasts, discussed orbit tracking software, ground-station equipment needs, and other basic topics.

In the room next door, Ray Soifer W2RS, AMSAT vice president for International Affairs, acted as master of ceremonies for an IARU (International Amateur Radio Union) satellite forum. Hans van de Groenendaal ZS5AKV, the IARU Amateur Satellite Advisor, gave an update on IARU activities over the past year, with emphasis on their impact on the international satellite allocations. Graham Ratliff VK5AGR, the IARU AMSAT Frequency Coordinator, discussed frequency coordination issues for current and future hamsats. The group unanimously reelected Graham to continue in his current position.

Frank Bauer KA3HDO, AMSAT vice president for Human Spaceflight Operations, discussed ARISS (Amateur Radio on the International Space Station) progress regarding callsigns for ARISS operation and other international concerns. Since the International Space Station (ISS) is indeed "international," it has been proposed that ham callsigns on ISS be licensed via the International Telecommunications Union (ITU), rather than individual countries.

The symposium continues

The Saturday presentations began in earnest promptly at 8 a.m. Duane Nagle KO6BT and his crew had everything ready to go. Bruce KK5DO was connected to the W0KIE network for the audio feed uplink to the Wisdom channel on C-band commercial satellite. Bruce had "Real Audio" recordings on his PC, but the Internet connection from the hotel was rather slow, so they were uploaded later to [http://www.amsatnet.com]. You can check out most of the symposium talks at this URL (Universal Resource Locator) on the Internet.

Jerry Smyth K8SAT made the first Saturday morning talk. Jerry described a satellite gateway station that he and other satellite enthusiasts have put on line in Detroit, Michigan. The system incorporates a computer-controlled IC-820 for the satellite side and an old crystal-controlled 220 MHz mobile rig to provide a link to a local two-meter repeater. His paper in the symposium proceedings gives basic information on the how and why of the project.

Dr. Bob Twiggs KE6QMD was on the schedule for a second talk on small satellites from the Department of Aeronautics and Astronautics at Stanford University and other educational institutions. Bob's Saturday presentation focused on the EMERALD Nanosatellite program with some historical perspectives. EMERALD consists of two separate satellites that are to fly in formation. Since these hamsat/edusats are scheduled for a space shuttle launch under

Photo I. *AMSAT President Keith Baker KB1SF makes a free phone call using one of the Qualcomm satellite phones using the Globalstar satellite constellation.*

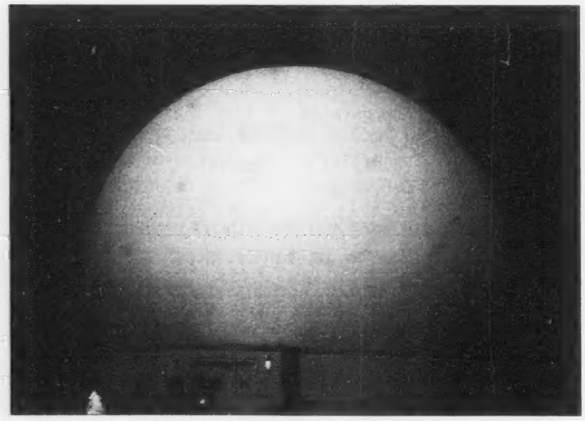

Photo J. *The Globalstar control/communications dishes at Qualcomm in San Diego, California, are housed in inflatable domes like this one.*

Photo K. *Jim Benson, founder of SpaceDev, explained the design and functions of a scientific interplanetary probe designed by his San Diego–based company.*

the SHELS (Shuttle Hitchhiker Experimental Launch System) program, the EMERALD satellites will be in a relatively low orbit. The disadvantage is limited access time from the ground, but the advantage is that remote-controlled drag panels can be incorporated to adjust the ballistic characteristics of the satellite to achieve the desired formation flying. There is significant air at a few hundred miles up. That's why low-orbit satellites eventually reenter the atmosphere.

The ham-radio communications experiments on the EMERALD satellites include the use of 70-cm frequencies for digital inter-satellite and ground communications. While the ham connection is limited, it offers amateur radio operators an opportunity to monitor the links, download the data, and participate in the program.

Bill Burden WB1BRE gave a short description of the potential uses of amateur satellites in emergency communications. Unlike HF, satellite communication is much more predictable for long distance work. The disadvantage is that an amateur satellite is not always available, but can at least be used for communications at specific times during any given day.

Matjaz Vidmar S53MV joined the group in San Diego to present his paper on "No-Tune Transceivers for the Microwave Bands." His tremendous technical expertise and excellent command of English, coupled with a keen sense of humor, delighted the audience. Matjaz and his group in Slovenia have produced hundreds of no-tune kits for hams in Europe covering the microwave bands from 1.2 to 10 GHz. His talk focused on the simple construction methods, inexpensive components, and innovative designs for his SSB and data transceivers.

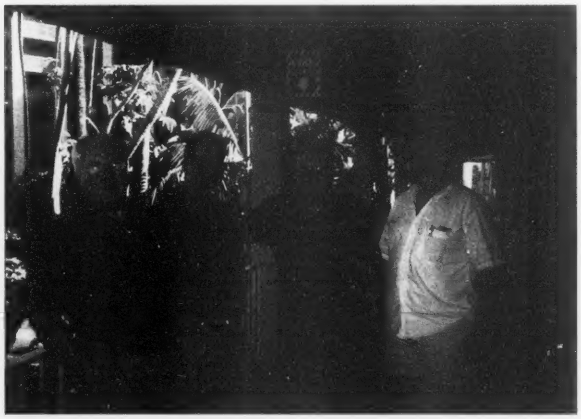

Photo L. *Taking a break during the AMSAT board of directors meeting, from L to R: Chairman of the Board Bill Tynan W3XO, First Alternate Mike Gilcrest KF4FDJ, AMSAT President Keith Baker KB1SF, and AMSAT Treasurer Art Feller W4ART. Why is that sign over Keith's head?*

Bob Bruninga WB4APR not only provided satellite demonstrations in the parking lot outside the Hanalei Hotel, but also gave a very informative talk about "AMSAT Builders' Channels for HT and Mobile Satellite Communications." Bob has proposed for some time that the rather under-utilized 1200-baud Pacsats like AMSAT-OSCAR-16, LUSAT-OSCAR-19 and ITAMSAT-OSCAR-26 allow UI (unconnected) packet digipeat activity for APRS (Automatic Position Reporting System) operation. In addition to simply sending position information for ground stations that have done very simple modifications to their packet TNCs (Terminal Node Controller) for Pacsat uplinking, short messages of any nature are supported by the APRS protocol. Bob demonstrated the innovative APRS functions in the Kenwood TH-D7 HT and also showed the new dual-band mobile radio with APRS that Kenwood will have available by the end of the year.

Although not on the published schedule, Hans van de Groenendaal provided an excellent synopsis of the capabilities of SUNSAT-OSCAR-35 and its early days in orbit. S-O-35 has been a great new hamsat resource since launch earlier this year. The university experiments are typically run during the week, and ham transponder activity is becoming a common weekend activity. The most popular ham use has been the FM single-channel transponder. It can be programmed for either Mode "B" (70-cm up and two meters down) or Mode "J" (two meters up and 70-cm down). Hans also announced a new award from AMSAT South Africa called the Sunsat Award.

Frank Bauer KA3HDO, AMSAT vice president of Human Spaceflight Operations, and Will Marchant KC6ROL, STS-93 SAREX Operations Manager, teamed up to discuss amateur radio on the International Space Station with references to the SAREX (Shuttle Amateur Radio EXperiment) program and its historical precedents. There are many ham activities slated for ISS, including HF, VHF, and UHF frequency coverage. Modes will include voice, packet, SSTV (Slow Scan Television) and FSTV (Fast Scan Television).

While Frank covered the overall program, Will mentioned some specific operations, especially the Express Pallet program. This is a unit that resembles a satellite, except that it is attached to the side of the station and contains a number of experiments and communications systems that can be controlled from the station or from Earth.

On STS-101, the space station 2A-2 mission scheduled for January or February, 2000, some VHF and UHF ham gear will be taken to orbit for voice and packet. The external antennas will be attached to the service module of the station on a subsequent flight, later in 2000. Until then, there are two other antennas that can be used for ham operations.

Lou McFadin W5DID joined Frank and Will at the podium to show and describe the dual-band (two meters and 70 cm) antenna to be used on the station. It is basically a quarter-wave flexible steel whip cut for two meters. It was then covered with Kapton tape and some tuning stubs mounted on the bottom to provide a good match on 70 cm. The material used for this antenna was from a surplus steel measuring tape left over from the AMSAT Microsat program 10 years ago. The Microsat antennas, and even the 10-meter dipole on AMSAT-OSCAR-6 (nearly 30 years ago), all incorporated steel tape measure elements.

Lou McFadin W5DID kicked off the discussion about Phase 3D. The spacecraft is complete and ready for shipment to South America to await launch on an *Ariane 5*. Lou pointed out that the satellite has components built by hams all over the world. Chuck Green N0ADI showed slides taken before, during, and after the thermal/vacuum and vibration tests in Maryland.

The annual meeting and more

Every year at the AMSAT Space Symposium, the final official activity is the annual meeting. With a launch contract in hand, the focus of the organization has changed gears. AMSAT's focus is to get the satellite shipped out and successfully into orbit. AMSAT has done well financially, but there are still many unforeseen expenses that will face the organization in the year 2000. AMSAT president Keith Baker KB1SF and board chairman Bill Tynan W3XO provided some insight on what the upcoming year will mean to AMSAT. Reserve funds will be tapped, but with a definite goal in sight, the launch of Phase 3D, additional support from the amateur-radio community may be forthcoming. The meeting ended on an upbeat note and the evening continued.

Jim Benson, the chairman of SpaceDev of San Diego, was the keynote speaker at the AMSAT banquet. Mr. Benson provided some thought-provoking ideas about the commercialization of space.

His company is working to provide transportation for scientific instrumentation to Earth orbit, the moon, Mars, and even nearby asteroids. His premise is that the cost of small missions can be held to levels much lower than those that directly involve government agencies.

After dinner, there were two more fun events. The AMSAT awards presentations are a means of recognizing the many volunteers who have distinguished themselves during the previous year with their efforts on behalf of AMSAT. Following the plaque presentations, prize drawings take over. Last year, there were so many prizes that almost everyone won something, whether it was a rig or coffee mug. This year, the San Diego group gave out dozens of daily prizes throughout the day on Friday and Saturday. The two dozen prizes that were left for the banquet were spectacular. New radios from Kenwood and Alinco topped the list of grand-prize offerings. Kenwood was also responsible for hats and special cloth bag/portfolios for all conference attendees.

Travel and tours

Three time-staggered tour groups took off for Qualcomm and SpaceDev on Sunday morning. Symposium attendees were already intimately familiar with some of Qualcomm's most recent products, portable and hand-held phones that worked with the Qualcomm GlobalStar satellite network. Qualcomm set up three GlobalStar phones outside the symposium meeting room for free use, including long-distance call. Boxes of hand-held satellite phones were also available for use outside. It was great fun, and the phones and connections were excellent. At the Qualcomm facilities, we got to see the labs where the phones were built, repaired, and tested. A tour of one of the radomes for a GlobalStar communications dish was a unique experience. More information about Qualcomm and the GlobalStar system can be found on the Internet at [http:// www. qualcomm.com].

After a short drive, the tour continued on to the SpaceDev facilities. SpaceDev has been described in the media as the world's first private space program. They have been in the business for a little over three years and have recently moved into a renovated indoor gun range with plenty of space for offices, meeting rooms, a clean room, and labs. The tour visited all of their facilities and included a presentation by Jim Benson, their founder, chairman and CEO, with supportive information from Rex Ridenoure, the chief mission architect. As a company they have not yet built any hardware that is in space, but many of the individuals in SpaceDev have. Their vice president of Space Engineering is Jan King W3GEY. Jan has been the key developer of many amateur-radio satellites, and in recent years, several commercial projects. Check out [http:// www.spacedev.com].

More meetings

Sunday afternoon marked the beginning of the AMSAT board of directors meeting. There were many topics for discussion. A complete transcription of the issues and resolutions will be available in the *AMSAT Journal*. A few of the major items included Phase 3D activities, the MOST project, ham radio on the International Space Station, and upcoming hamsats built by educational institutions.

With a launch contract in hand, AMSAT is now focused on the final preparation efforts to ship the satellite to Kourou. The Orlando lab personnel will complete final spin balancing and checkout with P3D project manager Karl Meinzer DJ4ZC and his group.

AMSAT-NA volunteers are currently working with Robert Zee VE3REZ, the Space Flight Laboratory Manager at the University of Toronto Institute for Aerospace Studies, as mentors for the MOST (Micro Oscillations of STars) satellite. The main payload is a small, fully steerable telescope system. The amateur-radio payload will include an L-band (1.2 GHz) and S-band (2.4 GHz) communications system (wideband DSP-based) coupled to a wideband remote-controlled receiver for propagation studies. The ham hardware is to weigh about four pounds, gets five watts of DC power, and fits into an 8.5- by 11- by 1-inch area of the satellite. The ham package has been dubbed "LEAST" for Lots of Extra Amateur Stuff on the Telescope. While MOST does not yet have a ride to space, launch is hoped for in 2001.

The flurry of new small satellites, built by universities and operating in the ham bands, has generated some concern in the amateur-radio community. The AMSAT board of directors has been monitoring these projects for years and has published guidelines on what is, and what is not, a "hamsat." With the recent debacle of SwatchSat/Beatnik, the small sputniklike satellite with commercially-oriented voice messages, AMSAT and universities with small satellite programs have been careful to stay within reasonable and legal bounds. The hamsat guidelines can be found at the AMSAT home page on the Internet: [http://www.amsat.org].

The board of directors meeting left all participants with an upbeat, enthusiastic feeling about AMSAT's projects for the upcoming year. Phase 3D has a future. New amateur-radio satellites from many sources have been launched in 1999, are being built, or are in design. Next year's meeting will be held in Portland, Maine. Plan to attend now.

A vast array of hamsats is now in orbit. The best way to prepare for Phase 3D is to operate via the current hamsat fleet. The "Proceedings of the AMSAT-NA 17th Space Symposium" is available from AMSAT [(301) 589-6062] for $15.00. Many of the talks can be heard via the Internet at [http://www. amsatnet.com]. Information about current satellites can be found at [http://www.amsat. org]. Check it out!

Number 53 on your Feedback card

CALENDAR

Listings are free of charge as space permits. Please send us your Calendar item two months in advance of the issue you want it to appear in. For example, if you want it to appear in the March issue, we should receive it by December 31. Provide a clear, concise summary of the essential details about your Calendar item.

JAN 8

LOVELAND, CO The Northern Colorado ARC will host their Superfest from 9 a.m.–3 p.m. at the Larimer County Fairgrounds, 700 Railroad Ave. VE exams, commercial exhibits, computers, radios and more. Reserve tables from *Michael Robinson N7MR, (970) 225-7501; or [michael@frii.com].* Talk-in on 145.115 (-100 Hz) or 146.52. For detailed information, see the Web page at *[www.info2000.net/~ncarc].*

JAN 15

ST. JOSEPH, MO The 10th annual Northwest Missouri Winter Hamfest will be held on Jan. 15th, 8 a.m.–3 p.m. at the Ramada Inn in St. Joseph. There will be special room rates for hamfest participants. The motel is located at I-29 and Frederick Ave. (exit 47 on I-29). Talk-in on 146.85 and 444.925. VE exams, major exhibitors, and flea market all indoors. Free parking. Admission $2 each or 3 for $5 in advance; at the door $3 each or 2 for $5. Swap tables 6 ft. by 2.5 ft. are $10 each for the first two tables, 3 or more for $20 each. This includes two chairs and a ticket. Commercial exhibitors welcome, write for details: *Northwest Missouri Winter Hamfest, c/o Dick Merrill KC0AMY, P.O. Box 1533, St. Joseph MO 64502; or call (816) 279-2304.*

JAN 16

HAZEL PARK, MI The Hazel Park ARC will hold their 34th Annual Swap & Shop at the Hazel Park High School, 23400 Hughes St., Hazel Park MI. Open to the public 8 a.m.–2 p.m. General admission is $5 in advance or at the door. Plenty of free parking. Tables are $14 each and reservations for tables must be received with a check. No reservations by phone. Talk-in on 146.64(-) the DART reptr. For more info about the swap, tickets or table reservations mail with an SASE to *HPARC, P.O. Box 368, Hazel Park MI 48030.*

YONKERS, NY The Metro 70 cm Network (WR2MSN) will present their Computer and Electronic Flea Market at Lincoln High School, Kneeland Ave., Yonkers NY, starting at 9 a.m. Vendor setup at 7 a.m. Free parking. Admittance is $6; under 12 years free. Talk-in on 440.425 PL 156.7; or 146.910 PL 114. Vendors should call *WB2SLQ after 7 p.m. at (914) 969-1053; or E-mail [Wb2slq@juno.com]* to register. This show will be held all-indoors.

JAN 23

BABYLON, NY A special day of education for amateur radio will be held on Long Island on Sunday, Jan. 23rd, 2000. This event will include technical forums on all aspects of amateur radio. It is not a flea market or hamfest. There will be no items for sale. Some of the forums will be on license restructuring, antennas, DXing, contesting, purchasing amateur radio equipment, packet, FLEXNET, ARES, APRS, satellite communications, and QRP (low power). There will also be a YL forum on issues concerning women amateur radio operators, and even more forums for everyone. In addition, there will be information booths for all the participating amateur radio clubs in the New York City/Long Island area, as well as booths for the ARRL, QCWA, a tune-up clinic and DXCC/WAS card checking. The event is "Ham Radio University 2000" and will be held Sunday, Jan. 23rd at the Babylon Town Hall Annex on Phelps Lane in Babylon NY. It will be open to the public 9 a.m.–3 p.m. Donation $2.00. Spouses, and children under 12 will be admitted free. Ample free parking. For more info contact *Phil Lewis N2MUN at [lewisp@hazeltine.com] or call (516) 226-0698.* The talk-in will be on the Great South Bay ARC repeater on 146.685, 136.5 PL.

JAN 30

DOVER, OH The Tusco ARC Hamfest will be held at the Ohio National Guard Armory, 2800 North Wooster Ave., Dover OH. Exit Interstate 77 at Exit #87 (Strasburg). Turn right at the exit stop sign, heading south on County Road 74 to the first traffic light. Continue through the traffic light intersection. The armory is on the right. Talk-in/check-in on 146.730(-). Admission is a $3 donation at the door. Dealers admitted at no charge. Tables are $10 each. The building opens at 6 a.m. for setup and will be open 8 a.m.–1 p.m. for the public. Food will be available on site, and after 7 a.m. at the restaurant next door. An ARES forum will also be featured. For more info and to reserve tables, contact *Billy L. Harper KB8CQG, P.O. Box 80407, Canton OH 44708. Tel. (330) 484-4634; Fax: (330) 484-4683; E-mail [bharper@neo.rr.com].*

FEB 11–13

ORLANDO, FL The Orlando ARC will sponsor the 53rd Orlando Hamcation Show and the ARRL State Convention, at the Central Florida Fairgrounds, located on Rt. 50 Colonial Dr., 3 miles west of I-4. Open Fri., Feb. 11th, 5 p.m.–9 p.m.; Sat., Feb. 12th, 9 a.m.–5 p.m.; and Sun., Feb. 13th, 9 a.m.–3 p.m. Over 150 commercial booths, over 400 swap tables. RV camping with elect. and water, $16 per night in advance or $20 at the gate. Admission $7 in advance or $9 at the gate. Commercial booths $225, swap tables $35 in advance or $45 at the gate. Tailgate $25 in advance or $35 at the gate. Price is for three days. Setup Fri., Feb. 11th 9 a.m.–4 p.m. Talk-in on 146.760(-). VE exams, must register in advance. Call *Gil Lineberry at (407) 843-4112.* You can join the foxhunt by registering by 4 p.m. at the info booth. Seminars, lectures, demonstrations, and special guest speakers. Check the Web site for up-to-date info at [www.oarc.org/hamcat.html]. Contact *Ken Christenson, 5548 C Cinderlane Pky., Orlando FL 32808; tel. (407) 291-2465; or E-mail [KD4JQR@arrl.net].*

FEB 13

MANSFIELD, OH The Mansfield Mid*Winter Hamfest and Computer show will be held Sun., Feb. 13th at the Richland County Fairgrounds in Mansfield. Doors open to the public at 7 a.m. Tickets are $4 in advance, $5 at the door. Tables are $10 in advance, $12 at the door, if available. Advance ticket/table orders must be received and paid by Feb. 1st. For additional info on advanced tickets or tables, send SASE to *Pat Akerman N8YOB, 63 N. Illinois Ave., Mansfield OH 44905; or tel. (419) 589-7133.* For talk-in call W8WE on 146.34/.94.

SPECIAL EVENTS, ETC.

DEC 10–11

BETHLEHEM, IN The Clark County ARC will operate W9WWI, 1500Z Dec. 10th–2200Z Dec. 11th in celebration of the Christmas season. Operation will be on General 75, 40, and 20 meters. QSL with an SASE for a certificate to *CCARC, 1805 E. 8th St., Jeffersonville IN 47130 USA.*

DEC 31–JAN 2

AUSTIN, TX The 3M ARC (W3MRC) of Austin TX will operate using the special callsign W2T, 1100 UTC Dec. 31st–2400 UTC Jan. 2nd. SSB operation will be on 7.230, 14.340, 21.410 and 28.350 MHz. For a certificate, send a large SASE with 2 stamps (see Web site for details). Send QSL to *3M ARC—W3MRC, A147-5S-03, 6801 Riverplace Blvd., Austin TX 78726-9000 USA.* See *[www.qsl.net/w3mrc]* for more info.

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You won't burn up our power supplies!

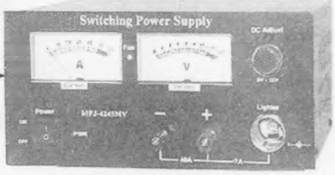
No RF Hash!

Switching Power Supply
A
V
MFJ-4225MV

← MFJ-4225MV
25 Amp
$149.95
plus s&h

MFJ-4245MV →
45 Amp
$199.95
plus s&h

No RF Hash!



They are fully protected with Over Voltage and Over Current protection circuits.

Worldwide Versatility

MFJ *MightyLites*™ can be used anywhere in the world! They have switchable AC input voltage and work from 85 to 135 VAC or 170 to 260 VAC. Replaceable fuse.

MightyLites™ . . . Mighty Features

Front-panel control lets you vary output from 9 to 15 Volts DC.

Front-panel has easy access five-way binding posts for heavy duty use and cigarette lighter socket for mobile accessories. MFJ-4245MV has two sets of quick-connects on the rear for accessories.

Brightly illuminated 3 inch meters let you monitor load voltage and current.

A whisper quiet internal fan efficiently cools your power supply for long life.

Two models to choose from . . .

MFJ-4225MV, $149.95. 25 Amps maximum or 22 Amps continuous. Weighs 3.7 pounds. Measures 5¾Wx4½Hx6D in.

MFJ-4245MV, $199.95. 45 Amps maximum or 40 Amps continuous. Weighs 5.5 pounds. Measures 7½Wx4¾Hx9D in.

NEW! **25 Amp *MightyLite*™**

MFJ-4125
25 Amp
$109.95
plus s&h

Super light, super compact switching power supply delivers 25 Amps maximum/22 Amps continuous at 13.8 Volts DC. Low ripple, highly regulated. *No RF Hash!* Five-way binding posts for high current. Quick connects for accessories. Over voltage/current protection. 110 or 220 VAC operation. Meets FCC Class B regs. 3.5 lbs. 5½Wx2½Hx10¾D in.

MFJ 35/30 Amp Adjustable Regulated DC Power Supply

Massive 19.2 pound transformer . . . No RF hash . . . Adjustable 1 to 14 VDC . . .

MFJ
REGULATED DC POWER SUPPLY
METER
V ADJ
FUSE

MFJ-4035MV
$149.95
plus s&h

MFJ's heavy duty conventional power supply is excellent for powering HF or 2 Meter/440 MHz transceiver/accessories.

A massive 19.2 pound transformer makes this power supply super heavy duty! It delivers 35 amps maximum and 30 amps continuous without even flexing its muscles. Plugs into any 110 VAC wall outlet.

It's highly regulated with load regulation better than 1%. Ripple voltage is less than 30 mV. *No RF hash* -- it's super clean!

Fully protected -- has over voltage protection, fold back short circuit protection and over-temperature protection.

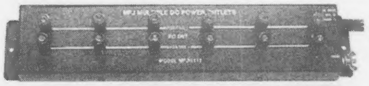
You get front panel adjustable voltage from 1 to 14 VDC with a convenient detent set at 13.8 VDC. A pair of front-panel meters let you monitor voltage and current.

Three sets of output terminals include a pair of heavy duty five-way binding posts for HF/VHF radios, two pairs of quick-connects for accessories and a covered cigarette lighter socket for mobile accessories.

A front-panel fuse holder makes fuse replacement easy. Whisper quiet fan speed increases as load current increases -- keeps components cool. 9½Wx6Hx9¾D inches.

MFJ *High Current* Multiple DC Power Outlets

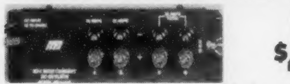
Power two HF/VHF transceivers and six or more accessories from your 12 VDC power supply



MFJ-1118
$74.95
plus s&h

MFJ-1116
$49.95
plus s&h

MFJ-1112
$34.95
plus s&h



New!
MFJ-1117
$44.95
plus s&h

MFJ-1118, $74.95. This is MFJ's most versatile and highest current *Deluxe Multiple DC Power Outlet*. Lets you power two HF and/or VHF transceivers and six or more accessories from your transceiver's main 12 VDC supply.

Two pairs of super heavy duty 30 amp 5-way binding posts connect your transceivers. Each pair is fused and RF bypassed. Handles 35 Amps total.Six pairs of heavy duty, RF bypassed 5-way binding posts let you power your accessories. They handle 15 Amps total, are protected by a master fuse and have an ON/OFF switch with "ON" LED indicator.

Built-in 0-25 VDC voltmeter. Six feet super heavy duty eight gauge color-coded cable with ring tongue terminals. Binding posts are spaced for standard dual banana plugs. Heavy duty aluminum construction. 12½x2¾x2½ in.

MFJ-1116, $49.95. Similar to MFJ-1118. No 30 amp posts. Has "ON" LED and 0-25 VDC voltmeter. 15 amps total.

MFJ-1112, $34.95. Similar to MFJ-1116. No on/off switch, LED, meter, fuse.

NEW! **MFJ-1117, $54.95.** For powering four HF /VHF radios (two at 35 Amps each and two at 35 Amps combined) simultaneously. Tiny 8x2x3 inches.

Free MFJ Catalog
and Nearest Dealer . . . 800-647-1800

http://www.mfjenterprises.com

• 1 Year *No Matter What*™ warranty • 30 day money back guarantee (less s/h) on orders direct from MFJ

MFJ

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FAX: (662) 323-6551; **Add s/h**
Tech Help: (662) 323-0549

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All are protected by MFJ's famous No Matter What™ one year limited warranty.

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Need a UHF Dipper?	Part 2: External coupling	W6WTU	NOV 10
Need a UHF Dipper?	Part 3: Mods for using the tuner	W6WTU	DEC 35
Simple RF Signal Generator	Add this test gear to your bench	W4LJD	SEP 32
Tutorials			
Defogging Microstrips	An intro to microstripline filters	WA9PYH	SEP 19
Easy Antenna Reference	Quick basics for a quick decision	VK2AT	FEB 52
Easy Antenna Reference	Part 2: More options	VK2AT	JUN 26
The Evolution of Power Supplies	Part 2: Switching techniques	W6WTU	JAN 21
Networking with Thevenin and Kirchhoff	Network analysis	W2GOM/7	MAY 30
Regens for the Millennium Part 2	Winding Coils	KA9GDL	JUL 22
Secrets of Transmission Lines	Part 1: Intro and dummy load project	KE2QJ	AUG 16
Secrets of Transmission Lines	Part 2: Review of AC fundamentals	KE2QJ	SEP 26
Secrets of Transmission Lines	Part 3: More AC review	KE2QJ	OCT 22
Secrets of Transmission Lines	Part 4: Traveling waves	KE2QJ	NOV 37
Secrets of Transmission Lines	Part 5: Impedance and reflections	KE1QJ	DEC 31
The Long-Lost Art of Conversational CW	Know what to say	WF6P	DEC 18
TV Tutor	How to get started in SSTV	ZL1AAN	DEC 22
Updates			
All About Op Amps	AUG 1999 issue, page 24	W2GOM/7	NOV 6
Mods for the OHR 100	FEB 1999 issue, page 32	W4LJD	MAR 54
Never Say Die	JAN 1999 issue (VERVE = FFRF)	W2NSD/1	MAR 54
Regens for the Millennium, Part 1	JUN 1999 issue, page 10	KA9GDL	JUL 56
VHF/UHF			
Above & Beyond	Ramsey FR-10 FM receiver	WB6IGP	FEB 39
Above & Beyond	Part 2: The Gunn diode modulator PS	WB6IGP	MAR 50
Above & Beyond	Extend test equip. to 24 GHz	WB6IGP	MAY 40
Above & Beyond	Microwave power meters	WB6IGP	JUN 40
Above & Beyond	Looking for Project Gigantic	WB6IGP	JUL 43
Above & Beyond	Restoring older multimode radios	WB6IGP	AUG 42
Above & Beyond	The IC-202 SSB transceiver	WB6IGP	SEP 43
Above & Beyond	The Internet, a new frontier	WB6IGP	OCT 45
Above & Beyond	Considerations for portable operation	WB6IGP	NOV 46
Above & Beyond	Microwave update 1999	WB6IGP	DEC 43

NEVER SAY DIE

continued from page 48

been mercilessly harassed by FDA teams and the AMA just for experimenting with the bioelectrifier. His results, with cancer, HIV, and so on, have been so spectacular that he's opening a clinic in Costa Rica to get away from the FDA threats and to make this marvelous way of saving lives available to more people.

Yes, I know, when I started writing about the bioelectrifier (blood purifier) back in 1994, you thought Wayne was nuts again. I'm used to that. Well, it saves many readers from bothering to think or do any homework. I was crazy when I predicted that the whole world would want to share our repeater technology. Back in 1969 I was making phone calls anywhere I wanted with my Motorola HT-220 from the New Hampshire ski slopes via my repeater. Then I was able to do the same when skiing in Aspen. I was so excited that I published hundreds of articles and book after book on repeaters. The result of the ham development of repeater technology was the worldwide cell phone system of today. Crazy Wayne.

Then the first microcomputer came along a few years later. The computer industry bigwigs said they were toys and that I was crazy when I said they'd eventually be in millions of homes and be on just about every desk in businesses. Those bigwigs are all out of business now.

The music and hi-fi magazines all sneered at CDs. Crazy Wayne started *CD Review*, which soon became the biggest music magazine in the world.

Have you built a bioelectrifier yet? What's stopping you? The parts cost under $20. Maybe you're waiting until your lifestyle knocks you on your ass before I'm able to get your attention. I've published two articles on how to build the device, but they're all sold out. The Miller circuit, plus a simpler one by Bob Beck, are in the *Bioelectrifier Handbook*, which is $10. See my ad on page 63. This book includes instructions on how to use it.

The electronically challenged can buy a Plant Growth Stimulator unit for $155 ppd. from Butterfly Products, Box 1729, Hillsborough NH 03244. It has essentially the same circuit and will, if you use it as intended, stimulate the hell out of your plants. This unit also includes pure silver wire and will make silver colloid for you.

Or you can get in touch with me for the address of the clinic in Costa Rica and save yourself the trouble of building a bioelectrifier.

A better approach, I feel, is to change your lifestyle so you won't need emergency repairs. Why wait until cancer, a heart attack, stroke, diabetes, arthritis, multiple sclerosis, and so on have hit?

And one of 'em surely will unless you make some big changes.

In All Fairness

An Irish television producer called. He was doing a program commemorating the Moon landings of thirty years ago, and one of his crew was a ham who had a copy of my *Moondoggle* book. Would I be available for an interview to present the contrarian side? The program would run from about 11 p.m. my time to 5

Continued on page 62

Number 60 on your Feedback card

PROPAGATION

Jim Gray W1XU/7
210 E Chateau Circle
Payson AZ 85541

December 1999						
SUN	MON	TUE	WED	THU	FRI	SAT
			1 G-F	2 F-P	3 P-VP	4 VP
5 VP-P	6 P	7 P-F	8 F-G	9 G	10 G	11 G
12 G	13 G	14 G	15 G	16 G	17 G	18 G-F
19 F	20 F	21 F-G	22 G-F	23 F	24 F	25 F-G
26 G	27 G-F	28 F	29 F-P	30 P	31 P-F	

December

Season's Greetings!

DXers can look forward to reasonably Good (G) radio propagation between the 9th and 17th; Fair (F) DX on the 19th, 20th, 23rd, 24th, and 28th; and Poor (P) or Very Poor (VP) propagation, with an upset to active geomagnetic field and a disturbed ionosphere on the 3rd through the 6th, and again on the 29th. The remaining days show trending conditions (see calendar).

Although winter DX propagation on the HF bands above 20 meters is generally poorer than in the Spring or Fall, because excitation of the E and F layers in the ionosphere is less, the solar flux index is expected to be up around the 200 level at this part of the sunspot cycle and DX propagation ought to be much better than it was last December.

Please pay particular attention to weather conditions December 3rd through the 6th, and again on or about the 30th, when severe winter storms could occur in parts of the United States. Other geophysical disturbances are also possible here and elsewhere in the world during these three or four days, so be prepared.

Forecasters are undecided about the anticipated occurrence of Cycle 23's sunspot maximum. Some predict it will occur sometime in the year 2000, while others — including this writer — tend to expect it sometime in 2001. Contrary to earlier expectations (and hopes) among radio amateurs, Cycle 23 is likely to rank as less than average, or poor, compared to previous recent cycles.

Nevertheless, the gradual decline of a cycle takes place over a period of five or six years until its sunspot minimum, so we still have a lot of good DX to look forward to in Cycle 23.

January 2000

Happy New Year!

As you can see from the calendar, January will provide everything from Good (G) to Very Poor (VP) radio propagation conditions on the HF bands.

Briefly, you may expect seasonally good (G) propagation from January 1-10, but conditions are expected to deteriorate for the next three weeks, ranging from only Fair (F) to Very Poor (VP).

The worst days are anticipated January 14–16, 23–25, and 28–30, when a disturbed magnetic field and ionospheric storms are likely. Severe signal fading and even short-lived communications "blackouts" over polar propagation paths may be expected on HF bands above 40 meters. Prepare for other geophysical effects, such as severe winter weather in the northern hemisphere, during (P) and (VP) periods.

The best advice is to *be prepared* with emergency power, food, water, and warm clothing, and continue to monitor WWV at eighteen minutes after any hour for the latest reports of Solar Flux, BA, and BK indices.

The 80-75 and 40-30 meter bands should provide some good, low-noise activity in the US, Canada, and South/Central America, but DX will depend on a relatively quiet magnetic field. On the poor days, however, don't despair, since transequatorial skip and over-the-poles signals will be present. The polar paths will be weak and full of echoes, whereas the transequatorial path will provide stronger signals, sometimes even on poor days.

The 160 meter band ought to be good for much of the month, so watch the calendar for the

EASTERN UNITED STATES TO:												
GMT:		02	04	06	08	10	12	14	16	18	20	22
ALASKA	15	20					20	20				15
ARGENTINA	20	40	40	40			20	15	15	10	10	15
AUSTRALIA	15	20	20		40	40	40			20	20	15
CENTRAL AM.	20	20	20	20	20	20	20	15	10	10	15	15
ENGLAND	40	40	40*	40*		20	15	10	15	20	20	
HAWAII	15	20					20	20	20	10	10	15
INDIA							20	20				
JAPAN	15	20					20	20				15
MEXICO	20	20	20	20	20	20	20	15	10	10	15	15
PHILIPPINES							20	20				
PUERTO RICO	20	20	20	20	20	20	20	15	10	10	15	15
RUSSIA (C.I.S.)							20	15	20	20		
SOUTH AFRICA	20	40*					20	10	10	10	15	20
WEST COAST	15/20	20/40	80	160	160	160				10	10	15
CENTRAL UNITED STATES TO:												
ALASKA	15							20				15
ARGENTINA	20	20	20	40	40		20	20	15	10	15	15
AUSTRALIA	15	20	20				40				15	10
CENTRAL AM.	15	20	40	40*	40*		20	15	10	10	10	15
ENGLAND	40	40	80					20	15	15	20	40
HAWAII	15	20		40	40	40*	40*	20	20	15	10	15
INDIA								20				
JAPAN	15							20				15
MEXICO	15	20	40	40*	40*		20	15	10	10	10	15
PHILIPPINES	15	20						20				15
PUERTO RICO	15	20	40	40*	40*		20	15	10	10	10	15
RUSSIA (C.I.S.)								20	15	20		
SOUTH AFRICA	20	40						15	10	10	15	20
WESTERN UNITED STATES TO:												
ALASKA	10	15	20				40	40	40			20
ARGENTINA	15	20		40	40			20		10	10	15
AUSTRALIA	10	15	20	20			40*	40*	20	20	15	15
CENTRAL AM.	15	20	20					20	15	10	10	10
ENGLAND	20	40	40						15	15	20	20
HAWAII	10	15	20	40	40	40		20	20	15	15	10
INDIA		15	20						20			
JAPAN	10	15	20				40	40	40			20
MEXICO	15	20	20					20	15	10	10	10
PHILIPPINES	10	15/20	15/20			40	40	40		20		20
PUERTO RICO	15	20	20				40	40	40			20
RUSSIA (C.I.S.)									20	20		
SOUTH AFRICA	20	20							15	10	15	15
EAST COAST	15/20	20/40	80	160	160	160				10	10	15

Table 1. December Band-Time-Country chart.

If you're a No-Code Tech, and you're having fun operating, tell us about it! Other No-Code Techs will enjoy reading about your adventures in ham radio—and we'll pay you for your articles. Yes, lots of nice clear photos, please. Call Joyce Sawtelle at 800-274-7373 to get a copy of "How to Write for *73* Magazine."

January 2000						
SUN	MON	TUE	WED	THU	FRI	SAT
						1 G
2 G	3 G	4 G	5 G	6 G	7 G-F	8 F
9 F-G	10 G	11 G-F	12 F	13 F-P	14 P-VP	15 VP-P
16 P	17 P-F	18 F	19 F-P	20 P-F	21 F	22 F-P
23 P	24 P-VP	25 VP-P	26 P-F	27 F-P	28 P-VP	29 VP-P
30 P	31 P-F					

good and fair days. The 20/18 meter and 15/12 meter bands will suffer the most along with 10 meters this month, so don't expect miracles. Perhaps in February we'll see some improvement, and March ought to get us back on the road to good worldwide DX conditions on all bands. Let's wait and see.

Remember to check the bands above and below the suggested ones for possible DX surprises. It's often a good idea to park your receiver on a seemingly unused frequency and just wait. A DX station is very likely to pop up before any one else hears him, and you can snag a good catch.

Please note that on the Band-Time-Country charts, (*) indicates a possible 80 meter opening. Good hunting! W1XU/7.

EASTERN UNITED STATES TO:												
GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	15					20	20	15	15			15
ARGENTINA	15	15	15	20/40	20/40						10	10
AUSTRALIA	15	15			20	20/40	20	20				
CENTRAL AM.	15	20	20/40	20/40	20/40	20	20	20	15	15	10	10
ENGLAND	40	40	40/30	40/30	40/30			10	10	15	20	40
HAWAII	15	15	20		40							15
INDIA	15	20			20							
JAPAN	15					20	20	15	15			15
MEXICO	15	20	20/40	20/40	20/40	20	20	20	15	15	10	10
PHILIPPINES	20						15			15	15	
PUERTO RICO	15	20	20/40	20/40	20/40	20	20	20	15	15	10	10
RUSSIA (C.I.S.)							20	15	20	20		
SOUTH AFRICA		40		20	20			15	15	15		
WEST COAST	15	20	40/80	40/80	40/80	40/80	80	20	10	10	10	10
CENTRAL UNITED STATES TO:												
ALASKA	15	15				40	20	20	20			
ARGENTINA	10	15	20/40	20/40							15	10
AUSTRALIA	15	15	15	20	20/40	20/40	20	20			15	
CENTRAL AM.	15	20	20/40	20/40	20/40	20	20	20	15	10	10	10
ENGLAND							20	15	10	15	20	
HAWAII	15	15	15	20	20/40	20/40			20			15
INDIA	15	20	20	20								
JAPAN	15	15				40	20	20	20			
MEXICO	15	20	20/40	20/40	20/40	20	20	20	15	10	10	10
PHILIPPINES	15		20	20			20	20	15	15		
PUERTO RICO	15	20	20/40	20/40	20/40	20	20	20	15	10	10	10
RUSSIA (C.I.S.)										20	20	
SOUTH AFRICA			40	20					15	20		
WESTERN UNITED STATES TO:												
ALASKA	15			20	20	20	20/40		20	15		15
ARGENTINA	10	15	15	15	20		20	20				10
AUSTRALIA	10	10	15	15	20	20	20/40	20	20			
CENTRAL AM.	15	15	20/40	20/40	20/40	20		15			10	10
ENGLAND									20	15	20	
HAWAII	10	15	15	20	20/40	20/40	20	20			15	10
INDIA			15					20		15		
JAPAN	15			20	20	20	20/40		20	15		15
MEXICO	15	15	20/40	20/40	20/40	20		15			10	10
PHILIPPINES					20	20	20	20	15	15		
PUERTO RICO	15	15	20/40	20/40	20/40	20		15			10	10
RUSSIA (C.I.S.)								20	20	20		
SOUTH AFRICA				20	20				20	15		
EAST COAST	15	20	40/80	40/80	40/80	40/80	80	20	10	10	10	10

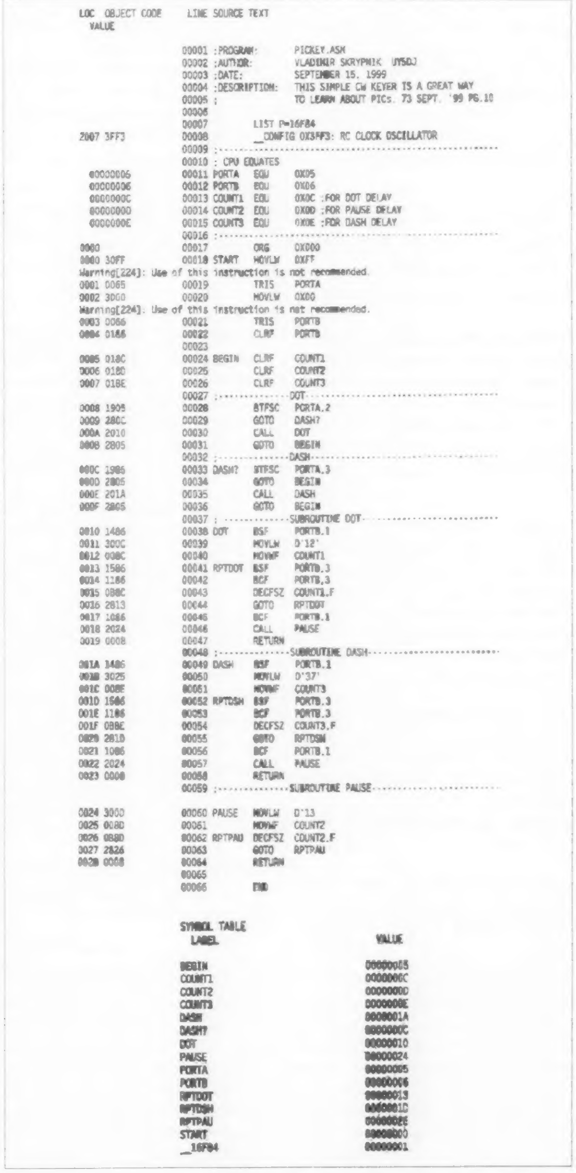
***Table 2.** January Band-Time-Country chart.*

Number 61 on your Feedback card

UPDATES

Professor Lynden McIntyre N8RXL, Sinclair Community College, Dayton OH 45402-1460; E-mail [lmcintyre@sinclair.edu]. I'm sending you a *tested* listing of PICKEY.ASM ("PIC Key, PIC Key," Sept. 1999, pp. 10ff.). Lines 19 and 20 still give a warning, and any changes I tried to make to these lines still gave me a warning or message. These two lines are not an error [as I originally suspected — see "Updates," October 1999, p. 64] and do work as originally printed. One additional fix is a RETURN at the end of the Dot subroutine at line 47. Without this fix, every dot becomes an "A" dit dah. With the previous fixes and this, the PIC keyer now will work OK.

Our thanks and those of other PICKeyers go to N8RXL for following through on this article. — ed.



```
LOC  OBJECT CODE     LINE SOURCE TEXT
  VALUE

                     00001 ;PROGRAM:       PICKEY.ASM
                     00002 ;AUTHOR:        VLADIMIR SKRYPNIK  UY5DJ
                     00003 ;DATE:          SEPTEMBER 15. 1999
                     00004 ;DESCRIPTION:   THIS SIMPLE CW KEYER IS A GREAT WAY
                     00005 ;               TO LEARN ABOUT PICs. 73 SEPT. '99 PG.10
                     00006
                     00007         LIST P=16F84
2007 3FF3            00008         __CONFIG 0X3FF3: RC CLOCK OSCILLATOR
                     00009 ;------------------------------------------------------
                     00010 ; CPU EQUATES
  00000005           00011 PORTA   EQU     0X05
  00000006           00012 PORTB   EQU     0X06
  0000000C           00013 COUNT1  EQU     0X0C ;FOR DOT DELAY
  0000000D           00014 COUNT2  EQU     0X0D ;FOR PAUSE DELAY
  0000000E           00015 COUNT3  EQU     0X0E ;FOR DASH DELAY
                     00016 ;------------------------------------------------------
0000                 00017         ORG     0X000
0000 30FF            00018 START   MOVLW   0XFF
Warning[224]: Use of this instruction is not recommended.
0001 0065            00019         TRIS    PORTA
0002 3000            00020         MOVLW   0X00
Warning[224]: Use of this instruction is not recommended.
0003 0066            00021         TRIS    PORTB
0004 0186            00022         CLRF    PORTB
                     00023
0005 018C            00024 BEGIN   CLRF    COUNT1
0006 018D            00025         CLRF    COUNT2
0007 018E            00026         CLRF    COUNT3
                     00027 ;--------------DOT---------------------------------------
0008 1905            00028         BTFSC   PORTA.2
0009 280C            00029         GOTO    DASH?
000A 2010            00030         CALL    DOT
000B 2805            00031         GOTO    BEGIN
                     00032 ;--------------DASH--------------------------------------
000C 1986            00033 DASH?   BTFSC   PORTA.3
000D 2805            00034         GOTO    BEGIN
000E 201A            00035         CALL    DASH
000F 2805            00036         GOTO    BEGIN
                     00037 ; -------------SUBROUTINE DOT---------------------------
0010 1486            00038 DOT     BSF     PORTB.1
0011 300C            00039         MOVLW   D'12'
0012 008C            00040         MOVWF   COUNT1
0013 1586            00041 RPTDOT  BSF     PORTB.3
0014 1186            00042         BCF     PORTB,3
0015 0B8C            00043         DECFSZ  COUNT1.F
0016 2813            00044         GOTO    RPTDOT
0017 1086            00045         BCF     PORTB.1
0018 2024            00046         CALL    PAUSE
0019 0008            00047         RETURN
                     00048 ;--------------SUBROUTINE DASH--------------------------
001A 1486            00049 DASH    BSF     PORTB.1
001B 3025            00050         MOVLW   D'37'
001C 008E            00051         MOVWF   COUNT3
001D 1586            00052 RPTDSH  BSF     PORTB.3
001E 1186            00053         BCF     PORTB.3
001F 0B8E            00054         DECFSZ  COUNT3.F
0020 281D            00055         GOTO    RPTDSH
0021 1086            00056         BCF     PORTB.1
0022 2024            00057         CALL    PAUSE
0023 0008            00058         RETURN
                     00059 ;--------------SUBROUTINE PAUSE-------------------------

0024 300D            00060 PAUSE   MOVLW   D'13
0025 008D            00061         MOVWF   COUNT2
0026 0B8D            00062 RPTPAU  DECFSZ  COUNT2.F
0027 2826            00063         GOTO    RPTPAU
0028 0008            00064         RETURN
                     00065
                     00066         END


                     SYMBOL TABLE
                       LABEL                             VALUE

                     BEGIN                             00000005
                     COUNT1                            0000000C
                     COUNT2                            0000000D
                     COUNT3                            0000000E
                     DASH                              0000001A
                     DASH?                             0000000C
                     DOT                               00000010
                     PAUSE                             00000024
                     PORTA                             00000005
                     PORTB                             00000006
                     RPTDOT                            00000013
                     RPTDSH                            0000001D
                     RPTPAU                            00000026
                     START                             00000000
                     __16F84                           00000001
```

Barter 'n' Buy

Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 100,000 active ham potential buyers can see it, rather than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any younger!
The *73* Flea Market, Barter 'n' Buy, costs you peanuts (almost)—comes to 35 cents a word for individual (noncommercial!) ads and $1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.
Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.
This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.
So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to: *73 Magazine*, Barter 'n' Buy, 70 Hancock Rd., Peterborough NH 03458 and get set for the phone calls. The deadline for the April 2000 classified ad section is February 10, 2000.

President Clinton probably doesn't have a copy of *Tormet's Electronics Bench Reference* but you should. Check it out at **[www.ohio.net/~rtormet/index.htm]**—over 100 pages of circuits, tables, RF design information, sources, etc. BNB530

Copies - *73* Magazine Nov. '63 thru Dec. '78. *QST* Magazine Nov. '63 thru Dec. '78. *Ham Radio* Magazine Mar. '68 thru July '79. *CQ* Magazine Dec. '64 thru Mar. '79. $2.00 Each Copy plus shipping. W.L. Brown, Box 541, Sullivan's Island SC 29482. Tel. (843) 883-3574. BNB73

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TELEGRAPH COLLECTOR'S PRICE GUIDE: 250 pictures/prices. $12 postpaid. **ARTIFAX BOOKS**, Box 88, Maynard MA 01754. Telegraph Museum: [http://wltp.com]. BNB113

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NEVER SAY DIE

continued from page 59

a.m. Sure, no problem. When I do the Art Bell show, I'm on from 1 to 6 a.m.

So I boned up on the most glaring reasons that convinced me that the Apollo trips had to have been faked. The station called at 11 p.m., as promised. Around 11:15, they gave me my first opportunity to talk. I started out by citing the deadly radiation in the Van Allen Belt and that dust without any atmosphere is like concrete, yet the photos supposedly taken on the Moon showed dust kicking up and lots of footprints.

Instead of having me on for the planned six hours of periodic rebuttal they thanked me and quickly hung up. In retrospect, what they expected was an amusing ranting by a crazy.

If It Bleeds

If it bleeds, it leads — that's the TV news motto. Well, the news shows have been trying to outdo each other, so the recent "ethnic cleansing" in Yugoslavia has been great for ratings. Lots of blood. I'm old enough so I remember when we used to call it genocide, but then "cleansing" is a lot cleaner than anything ending in cide.

But when did the US get elected to be the world's policeman, and by whom? I don't recall being consulted.

We sat by during the Ebo genocide in Nigeria, and again in Laos and Cambodia, and again in Rwanda, and Burundi. We didn't even say boo when Mao wiped out about 80 million Chinese teachers and land owners. Nor when Stalin did the same with his teachers and military officers.

So when are we going to invade Sri Lanka, Miramar, Timor and other genocidal areas and put a stop to the cleansing that is going on all around the world? They need us in Guatemala, Peru, and at least 50 other countries, so let's first get our TV reporters out there, then let's follow them up with American soldiers.

Our refusal to invade Tibet and show those damned Chinese what's what is an absolute disgrace, and at least half the countries of Africa are ripe for an invasion.

What we need to do is to get busy and invade these small countries and set them up with proven civilized systems such as we have for educating our children, providing our health care, keeping drugs from our children, and eliminating poverty. 73

Wise Up!

Here are some of my books which can change your life (if you'll let 'em). If the idea of being healthy, wealthy and wise interests you, start reading. Yes, you can be all that, but only when you know the secrets which I've spent a lifetime uncovering.

......Wayne

The Bioelectrifier Handbook: This explains how to build or buy ($155) a little electrical gadget that can help clean the blood of any virus, microbe, parasite, fungus or yeast. The process was discovered by scientists at the Albert Einstein College of Medicine, quickly patented, and hushed up. It's curing AIDS, hepatitis C, and a bunch of other serious illnesses. The circuit can be built for under $20 from the instructions in the book. $10 (01)

The Secret Guide to Wisdom: This is a review of around a hundred books that will help you change your life. No, I don't sell these books. They're on a wide range of subjects and will help to make you a very interesting person. Wait'll you see some of the gems you've missed reading. $5 (02)

The Secret Guide to Wealth: Just as with health, you'll find that you have been brainwashed by "the system" into a pattern of life that will keep you from ever making much money and having the freedom to travel and do what you want. I explain how anyone can get a dream job with no college, no résumé, and even without any experience. I explain how you can get someone to happily pay you to learn what you need to know to start your own business. $5 (03)

The Secret Guide to Health: Yes, there really is a secret to regaining your health and adding 30 to 60 years of healthy living to your life. The answer is simple, but it means making some difficult lifestyle changes. Will you be skiing the slopes of Aspen with me when you're 90 or doddering around a nursing home? Or pushing up daisies? No, I'm not selling any health products. $5 (04)

My WWII Submarine Adventures: Yes, I spent from 1943-1945 on a submarine, right in the middle of the war with Japan. We almost got sunk several times, and twice I was in the right place at the right time to save the boat. What's it really like to be depth charged? And what's the daily life aboard a submarine like? How about the Amelia Earhart inside story?If you're near Mobile, please visit the Drum. $5 (10)

Travel Diaries: You can travel amazingly inexpensively – once you know the ropes.Enjoy Sherry and my budget visits to Europe, Russia, and a bunch of other interesting places. How about a first class flight to Munich, a rented Audi, driving to visit Vienna, Krakow in Poland (and the famous salt mines), Prague, back to Munich, and the first class flight home for two, all for under $1,000. Yes, when you know how you can travel inexpensively, and still stay in first class hotels. $5 (11)

Wayne's Caribbean Adventures: More budget travel stories – where I visit the hams and scuba dive most of the islands of the Caribbean. Like the special Liat fare which allowed us to visit 11 countries in 21 days, with me diving all but one of the islands, Guadeloupe, where the hams kept me too busy with parties. $5 (12)

Cold Fusion Overview: This is both a brief history of cold fusion, which I predict will be one of the largest industries in the world in the 21st century, plus a simple explanation of how and why it works. This new field is going to generate a whole new bunch of billionaires, just as the personal computer industry did. $5 (20)

Cold Fusion Journal: They laughed when I predicted the PC industry growth in 1975. PCs are now the third largest industry in the world. The cold fusion ground floor is still wide open, but then that might mean giving up watching ball games. Sample: $10 (22).

Julian Schwinger: A Nobel lauriate's talk about cold fusion— confirming its validity. $2 (24)

Improving State Government: Here are 24 ways that state governments can cut expenses enormously, while providing far better service. I explain how any government bureau or department can be gotten to cut it's expenses by at least 50% in three years and do it cooperatively and enthusiastically. I explain how, by applying a new technology, the state can make it possible to provide all needed services without having to levy *any* taxes at all! Read the book, run for your legislature, and let's get busy making this country work like its founders wanted it to. Don't leave this for "someone else" to do. $5 (30)

Mankind's Extinction Predictions: If any one of the experts who have written books predicting a soon-to-come catastrophe which will virtually wipe us all out are right, we're in trouble. In this book I explain about the various disaster scenarios, from Nostradamus, who says the poles will soon shift, wiping out 97% of mankind, to Sai Baba, who has recently warned his followers to get out of Japan and Australia before December 6th this year. The worst part of these predictions is the accuracy record of some of the experts. Will it be a pole shift, a new ice age, a massive solar flare, a comet or asteroid, a bioterrorist attack, or even Y2K? I'm getting ready, how about you? $5 (31)

Moondoggle: After reading René's book, *NASA Mooned America*, I read everything I could find on our Moon landings. I watched the videos, looked carefully at the photos, read the astronaut's biographies, and talked with some of my readers who worked for NASA. This book cites 25 good reasons I believe the whole Apollo program had to have been faked. $5 (30)

Classical Music Guide: A list of 100 CDs which will provide you with an outstanding collection of the finest classical music ever written. This is what you need to help you reduce stress. Classical music also raises youngster's IQs, helps plants grow faster, and will make you healthier. Just wait'll you hear some of Gotschalk's fabulous music! $5 (33)

The Radar Coverup: Is police radar dangerous? Ross Adey K6UI, a world authority, confirms the dangers of radio and magnetic fields. $3 (34)

Three Gatto Talks: A prize-winning teacher explains what's wrong with American schools and why our kids are not being educated. Why are Swedish youngsters, who start school at 7 years of age, leaving our kids in the dust? Our kids are intentionally being dumbed down by our school system — the least effective and most expensive in the world. $5 (35)

Aspartame: a.k.a. NutraSweet, the stuff in diet drinks, etc., can cause all kinds of serious health problems. Multiple sclerosis, for one. Read all about it, three pamphlets for a buck. (38)

One Hour CW: Using this sneaky method even *you* can learn the Morse Code in one hour and pass that dumb 5wpm Tech-Plus ham test. $5 (40)

Code Tape (T5): This tape will teach you the letters, numbers and punctuation you need to know if you are going on to learn the code at 13 or 20 wpm. $5 (41)

Code Tape (T13): Once you know the code for the letters (41) you can go immediately to copying 13 wpm code (using my system). This should only take two or three days. $5 (42)

Code Tape (T20): Start right out at 20 wpm and master it in a weekend for your Extra Class license. $5 (43)

Wayne Talks Not at Dayton: This is a 90-minute tape of the talk I'd have given at the Dayton, if invited. $5 (50)

Wayne Talks at Tampa: This is the talk I gave at the Tampa Global Sciences conference. I cover cold fusion, amateur radio, health, books you should read, and so on. $5 (51)

$1 Million Sales Video: How to generate extra million in sales using PR. This will be one of the best investments your business ever made. $43 (52)

Reprints of My Editorials from *73*.

Grist I: 50 of my best non-ham oriented editorials from before 1997. $5 (71)

Grist II: 50 more choice non-ham editorials from before 1997.$5 (72)

1997 Editorials: 148 pages. 216 editorials discussing health, ideas for new businesses, exciting new books I've discovered, ways to cure our country's more serious problems, flight 800, the Oklahoma City bombing, more Moon madness, and so on. $10 (74)

1998 Editorials: 168 pages that'll give you lots of controversial things to talk about on the air. $10 (75)

Silver Wire: With two 3" pieces of heavy pure silver wire + three 9V batteries you can make a thousand dollars worth of silver colloid. What do you do with it? It does what the antibiotics do, but germs can't adapt to it. Use it to get rid of germs on food, for skin fungus, warts, and even to drink, Read some books on the uses of silver colloid, it's like magic. $15 (80)

Wayne's Bell Saver Kit. The cable and instructions enabling you to inexpensively tape Art Bell W6OBB's nightly 5-hr radio talk show. $5 (83)

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Last Skeptic of Science: This is René's book where he debunks a bunch of accepted scientific beliefs – such as the ice ages, the Earth being a magnet, the Moon causing the tides, and etc. $25 (91)

Dark Moon: 568 pages of carefully researched proof that the Apollo Moon landings were a hoax. $35 (92)

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MFJ uses super heavy duty components -- roller inductor, variable capacitors, antenna switch and balun -- to build the world's most popular high power antenna tuner.

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MFJ AirCore™ Roller Inductor gives high-Q, low loss, high efficiency and high power handling.

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Two knob tuning (differential capacitor and *AirCore*™ roller inductor) makes tuning foolproof and easier than ever. Gives minimum SWR at only one setting. Handles 3 KW PEP SSB amplifier input power (1.5 KW output). Gear-driven turns counter, lighted peak/average Cross-Needle SWR/Wattmeter, antenna switch, balun. 1.8 to 30 MHz. 10³/₄Wx4¹/₂Hx15 in.

MFJ-962D *compact* Tuner for Amps

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A few more dollars steps you up to a KW tuner for an amp later. Handles 1.5 KW PEP SSB amplifier input power (800W output). Ideal for Ameritron's AL-811H! *AirCore*™ roller inductor, gear-driven turns counter, pk/avg lighted Cross-Needle SWR/Wattmeter, antenna switch, balun, Lexan front, 1.8-30MHz. 10³/₄x4¹/₂x10⁷/₈ in.

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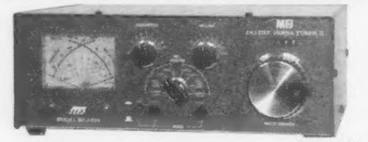

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MFJ-949E *deluxe* 300 Watt Tuner

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More hams use MFJ-949s than any other antenna tuner in the world! Handles 300 Watts. Full 1.8 to 30 MHz coverage, 48 position *Precision48*™ inductor, 1000 Volt tuning capacitors, *full size* peak/average lighted Cross-Needle SWR/Wattmeter, 8 position antenna switch, dummy load, *QRM-Free PreTune*™, scratch proof Lexan front panel. 3¹/₂Hx10⁵/₈Wx7D inches. **MFJ-948, $129.95.** Economy version of MFJ-949E, less dummy load, Lexan front panel.

MFJ-941E *super value* Tuner

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MFJ-945E HF+6 Meter *mobile* Tuner

MFJ-945E
$109⁹⁵

Extends your mobile antenna bandwidth so you don't have to stop, go outside and adjust your antenna. Tiny 8x2x6 in. *Lighted* Cross-Needle SWR/Wattmeter. Lamp and bypass switches. Covers 1.8-30 MHz *and* 6 Meters. 300 Watts PEP. **MFJ-20, $4.95,** mobile mount.

MFJ-971 *portable/QRP* Tuner

MFJ-971
$99⁹⁵

Tunes coax, balanced lines, random wire 1.8-30 MHz. Cross-Needle Meter. SWR, 30/300 or 6 Watt QRP ranges. Matches popular MFJ transceivers. Tiny 6x6¹/₂x2¹/₂ inches.

MFJ-901B *smallest* Versa Tuner

MFJ-901B
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MFJ's smallest (5x2x6 in.) and most affordable wide range 200 Watt PEP Versa tuner. Covers 1.8 to 30 MHz. Great for matching solid state rigs to linear amps.

MFJ-16010 *random* wire Tuner

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Operate all bands anywhere with MFJ's reversible L-network. Turns random wire into powerful transmitting antenna. 1.8-30 MHz. 200 Watts PEP. Tiny 2x3x4 in.

MFJ-906/903 *6 Meter* Tuners

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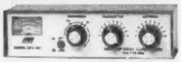
MFJ-906 has lighted Cross-Needle SWR/Wattmeter, bypass switch. Handles 100 W FM, 200W SSB. **MFJ-903, $49.95,** Like MFJ-906, less SWR/Wattmeter, bypass switch.

MFJ-921/924 *VHF/UHF* Tuners



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Ultra tiny 4x2¹/₂x1¹/₄ inch tuner covers VHF 136-175 MHz and UHF 420-460 MHz. SWR/Wattmeter reads 60/150 Watts.

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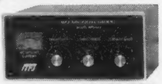

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JST-245

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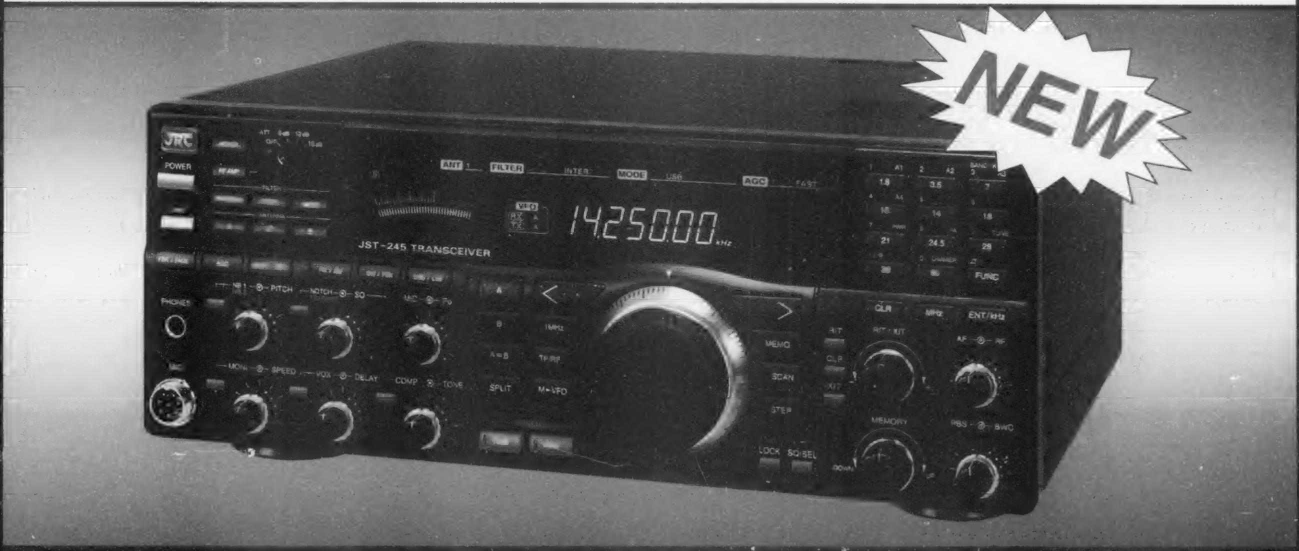

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2 MOSFET POWER AMPLIFIER • Final PA utilizes RF MOSFETs to achieve low distortion and high durability. Rated output is 10 to 150 watts on all bands including 6 meters.

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4 MULTIPLE ANTENNA SELECTION • Three antenna connections are user selectable from front panel. Antenna selection can be stored in memory.

5 GENERAL COVERAGE RECEIVER • 100 kHz-30 MHz, plus 48-54 MHz receiver. Electronically tuned front-end filtering, quad-FET mixer and quadruple conversion system (triple conversion for FM) results in excellent dynamic range (>100dB) and 3rd order ICP of +20dBm.

6 IF BANDWIDTH FLEXIBILITY • Standard 2.4 kHz filter can be narrowed continuously to 800 Hz with variable Bandwidth Control (BWC). Narrow SSB and CW filters for 2nd and 3rd IF optional.

7 QRM SUPPRESSION • Other interference rejection features include Passband Shift (PBS), dual noise blanker, 3-step RF attenuation, IF notch filter, selectable AGC and all-mode squelch.

8 NOTCH TRACKING • Once tuned, the IF notch filter will track the offending heterodyne (±10 Khz) if the VFO frequency is changed.

9 DDS PHASE LOCK LOOP SYSTEM • A single-crystal Direct Digital Synthesis system is utilized for very low phase noise.

10 CW FEATURES • Full break-in operation, variable CW pitch. built in electronic keyer up to 60 wpm.

11 DUAL VFOs • Two separate VFOs for split-frequency operation. Memory registers store most recent VFO frequency, mode, bandwidth and other important parameters for each band.

12 200 MEMORIES • Memory capacity of 200 channels, each of which store frequency, mode, AGC and bandwidth.

13 COMPUTER INTERFACE • Built-in RS-232C interface for advanced computer applications.

14 ERGONOMIC LAYOUT • Front panel features easy to read color LCD display and thoughtful placement of controls for ease of operation.

15 HEAVY-DUTY POWER SUPPLY • Built-in switching power supply with "silent" cooling system designed for continuous transmission at maximim output.

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- Works with any Computer Running Windows 3.1, 95 or NT
- Covers all Amateur HF Bands plus General Coverage Receiver
- IF Stage 16/24 Bit Digital Signal Processing (DSP)
- II DSP Bandpass Filter Widths from 100 Hz to 3.5 kHz (6 kHz in AM Mode)
- Band Activity Display with "Point and Click" Frequency Tuning
- On-screen Antenna "Smith" Chart, Logging Software and Help Menus
- Automatic Frequency Calibration from WWV or Other External Standard
- "Snapshot" Keys for Instant Recall of Frequencies and Settings
- Optional Internal Antenna Tuner

The Kachina 505DSP Computer Controlled HF Transceiver After twenty years of building commercial transceivers in Arizona, Kachina has decided the time is right for a new approach to amateur radio. The Kachina 505DSP is nothing short of a revolution in HF transceivers.

Why Use Knobs If You Have Windows? The old-fashioned front panel has become too cluttered to be useful. Too many knobs, too many buttons. Kachina's 505DSP transceiver connects to your computer's serial port and is completely controlled under Windows™. With optional cables, the radio may be remotely located up to 75 feet away from your computer. Imagine combining a state-of-the-art DSP transceiver with the processing power and graphics capabilities of your PC and you'll soon wonder why all radios aren't designed this way. Why settle for a tiny LCD display when your computer monitor can simultaneously show band activity, antenna impedance, heat sink temperature, SWR, forward and/or reflected power and a host of other information?

16/24 Bit DSP/DDS Performance In addition to 100% computer control, the Kachina 505DSP offers exceptional 16/24 bit DSP/DDS performance. IF stage DSP, "brick-wall" digital filtering, adaptive notch filters and digital noise reduction, combined with low in-band IMD and high signal-to-noise ratio, produce an excellent sounding receiver. Sophisticated DSP technology achieves performance levels unimaginable in the analog world. The transmitter also benefits from precise 16/24 bit processing. Excellent carrier and opposite-sideband suppression is obtained using superior phasing-method algorithms. The RF compressor will add *lots* of punch to your transmitted signal without adding lots of bandwidth, and the TX equalizer will allow you to tailor your transmitted audio for more highs or lows.

Seeing is Believing American-made and designed, and able to stand on its own against the world's best, the 505DSP is bound to set the standard for all that follow. But don't take our word for it. Visit our website at http://www.kachina-az.com for detailed specifications, to download a demo version of our control software, or to see a current list of Kachina dealers displaying demonstration models in their showrooms.

Windows is a trademark of Microsoft Corp.
Specifications and features subject to change without notice.

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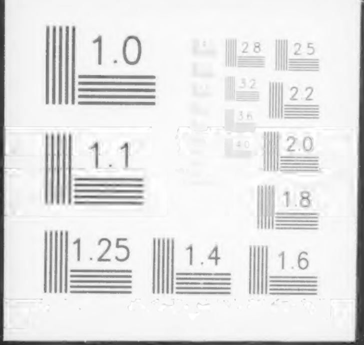
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